GROUND COLLISIONS AND RUNWAY INCURSIONS

(102-2)

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON
PUBLIC WORKS AND TRANSPORTATION
HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

FIRST SESSION

FEBRUARY 28, 1991

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February 26, 1991

To: Members, Subcommittee on Aviation

From: Committee Aviation Staff

Re: SUMMARY OF SUBJECT MATTER for hearing on February 28, 1991 on GROUND COLLISIONS AND RUNWAY INCURSIONS

The Subcommittee will receive testimony on the problem of ground collisions and runway incursions and the adequacy of government and industry actions and plans to eliminate the problem.

The Ground Collision Problem

Three major incidents and three accidents since 1985 have heightened awareness and concern within the government agencies responsible for safety, the aviation industry and the traveling public over the potential for ground collisions between aircraft.

- On March 31, 1985 at Minneapolis, one Northwest Airlines DC-10 lifted off prematurely in order to miss another Northwest DC-10 crossing the runway. The aircraft came within 50-75 feet of each other.
- On December 15, 1987 at Kansas City, an Eastern Airlines 727 rejected a takeoff and averted a collision after a general aviation aircraft was cleared onto the same runway.
- On November 13, 1988 at Boston, a Pan American 727 was forced to lift off early in order to miss a commuter aircraft that had been cleared onto the same runway.
- On January 18, 1990 at Atlanta, an Eastern Airlines 727 collided upon landing with a general aviation aircraft that had just landed on the same runway. Two persons on the general aviation aircraft perished.
- On December 3, 1990 at Detroit, a Northwest Airlines 727 that had just landed struck a Northwest DC-9 taxing on the active runway in fog. There were 8 fatalities.

- On February 1, 1991 at Los Angeles, a USAir 737 that had just landed struck a commuter aircraft that had been cleared to be on the runway. Twenty two persons on the 737, and 12 on the commuter aircraft were killed.

Ground collisions are extremely rare events when compared to the number of aircraft movements. Since 1975, there have been nine ground collisions involving airline aircraft. The number of ground collisions per the total number of flights during this period is approximately one per 10 million. Ground collisions account for only approximately 2% of all airline accidents. However, it is important to note that one accident in 1977, a ground collision between two Boeing 747s, is not included in this data, because it occurred overseas at Tenerife in the Canary Islands. In this accident, 583 people perished making it the largest loss of life in a single accident.

Despite the rarity of ground collisions, there is a sense within the aviation safety community that the potential for ground collisions is one of the most significant safety issues confronting aviation today. Two of the nine accidents cited above have occurred since December, but even before these two recent accidents, the National Transportation Safety Board last October put implementation of recommendations regarding runway incursions on a "Most Wanted" list of safety recommendations. (These recommendations will be described later.)

Since April 1987, after hearings on near mid-air collisions and runway incursions by the Subcommittee on Investigations and Oversight (Committee Publication 100-14), the FAA has developed an improved system of collecting and analyzing data on runway incursions. A runway incursion occurs when an aircraft or other vehicle ends up on an active runway without being cleared to be there. Since 1986, the annual number of these occurrences has ranged between 179 and 382, with between 86 and 99 annually involving an airline aircraft. The trend line since 1989 has been up after dropping by half from 1987 to 1988. However, it is believed these swings are more attributable to reporting variability than true fluctuations of this magnitude in the incidence of runway incursions.

Irrespective of the validity of the trend line, there is universal agreement within the government and industry that this level of incidence needs to be dramatically reduced. Analyses by the NTSB and the Federal Aviation Administration of these runway incidents indicate that there have been a significant number in which only miraculous luck has worked to keep some of these close calls from becoming accidents.

The concern over the potential for ground collisions has also been heightened by dramatic increases in air traffic, without similar increases and expansions in airport runway and taxiway capacity. In 1975, there were 4.7 million airline flights; in 1980, 5.7 million; in 1985, 6.3 million; and in 1990, 7.6 million flights, a 62% increase over 1975. While much of this growth in overall activity has taken place at new hubs or previously underutilized hubs, traffic has continued to grow also at some large hubs that have been described by the FAA since the early 1980s as "airports with severe airside congestion." Airside expansion at these airports has been very limited or negligible. Concerns about congestion at hub airports will continue as traffic growth is expected to outpace capital improvements at some airports through the 1990s.

Finally, air traffic controller staffing also has not kept pace with the traffic growth particularly in light of the firing of 11,400 controllers (two-thirds of the workforce) in 1981 after an illegal strike. Controller staffing deficiencies have been cited as important factors in a number of NTSB investigations of ground collisions and runway incursions.

Causes and Solutions to the Collision/Incursion Problem

The NTSB and the FAA have issued two major reports on the safety issues associated with ground collisions and runway incursions. In 1986, the NTSB issued a "Special Investigations Report" that analyzed 26 selected incidents, and in April 1990, the FAA issued a report, "Runway Incursions: An FAA Report." Both reports come to similar conclusions and recommendations to solve the problem. These reports found the problem of runway incursions to be very complex and often multifaceted. The vast preponderance of incidents involved errors by air traffic controllers and/or pilots. Within the aviation safety community, human error is usually judged as the most difficult safety problem to fix.

Among the types of errors committed by controllers in runway incursion incidents have been incomplete or misunderstood coordination among controllers, forgotten aircraft, forgotten previous coordination, poor communication techniques, and failure to adequately scan the airport runways and taxiways. Pilots were found failing to comply with clearances, failing to communicate properly, and failing to be as observant while taxiing.

Contributing to these errors, the agencies identified more systemic problems of poor airport signage, inadequate controller supervision, training, and education, deficient controller staffing, excessive controller workload, and poor communications procedures.

Numerous safety recommendations have been made by the NTSB to deal with ground collisions and runway incursions with numerous follow-up actions being taken by the FAA to rectify the identified problems. However, from the Board's perspective, three recommendations in this area remain outstanding and are among the October 1990 "Most Wanted" list of safety recommendations:

- o "Require controllers to obtain a readback [from pilots] for all hold, takeoff, or crossing clearances and for clearances onto an active runway."

- o "Revise and enforce the requirements to report and to investigate operational errors, pilot deviations, and near-midair collisions that involve aircraft on the ground as well as in the air, and develop a combined data for comprehensive procedural and human performance causal analyses of runway incursions."

- o "Determine the most effective signs, markings, and procedures, from an operational and human performance perspective, to prevent pilot-induced runway incursions and issue an advisory circular to disseminate the information to airport managers and pilot organizations."

Though these recommendations had not been fully implemented at that point (October 1990), the Board characterized the FAA's actions to implement the recommendations as "acceptable."

The FAA's New Runway Incursion Plan

Three weeks ago, on February 7, the FAA announced a plan aimed at reducing the incidence of aircraft and other vehicles straying onto runways which they should not be on. The plan is the product of a team of FAA officials from a wide range of organizations within the agency. The team commenced development of the plan on January 8, 1991, but the plan's genesis was the recommendations of the April 1990 report by the Assistant Administrator for Aviation Safety referred to earlier. Issuance of the Runway Incursion Plan, anticipated for later this Spring, was accelerated after the accident earlier this month at the Los Angeles Airport.

While the FAA has undertaken a number of discrete initiatives and responded to a variety of NTSB recommendations over the past several years, the plan is an attempt to develop an integrated, coordinated and more centralized approach to the problem of ground collisions and runway incursions.

Since the plan has been issued very recently, there is no way yet of assessing its effectiveness. The plan does clearly identify numerous future program milestones and timetables for action. Also, individuals at the FAA who will be held accountable for a specific program's performance are identified by name.

Beyond a new management approach to the problem of runway incursions, the plan identifies 25 ongoing and 19 new projects and programs in the following areas: improved visual aids for pilots; air traffic controller aids; changes to air traffic procedures; improved air traffic control technology; improved education for pilots and controllers to avoid runway incursions; and improved analysis tools and data bases.

Without describing each of the individual projects, this summary will provide a brief description of the more significant initiatives in the plan. If desired, the Committee's aviation staff can provide detail beyond this summary.

Visual Aids

o The FAA plans to showcase state-of-the-art marking, lighting and signage and other technologies at four airports, Boston, Seattle, Pittsburgh and the new Denver airport. The FAA plans to devote $30 million in Airport Improvement Program grants to this program beginning in September 1991.

o The FAA plans to develop standards for runway and taxiway signs to minimize confusion by pilots about their location or where they are going. Presently, different airports use signs with different symbols, colors, words or letters. Work is underway, both at the FAA and the International Civil Aviation Organization, to develop uniform sign standards for airports around the world. The FAA expects to issue standards next July with the new signage installed at U.S. airports by the end of 1993.

o The FAA plans to develop and test lights that warn pilots where to stop after landing on a runway that intersects with another runway. This development and testing will be completed this summer. A timetable beyond this has not been specified. The FAA is also demonstrating the use of lighted stop-bars at the intersections of taxiways and runways at JFK Airport in New York. A report on this demonstration is expected in June 1992.

Controller Aids

o The FAA is installing a device that notifies controllers in the tower when there is vehicular traffic, such as snow removal, on the runway for an extended period of time. Installation at the more active towers is expected to be completed in June 1992.

o Human factors oriented evaluations and reports focusing on controller memory enhancement and visual scanning workloads are ongoing.

Procedures

o The FAA intends to standardize nationally a procedure whereby pilots must acknowledge "holding" instructions. This will reduce confusion over which pilots are intended to be the recipient of which air traffic control instructions.

Technology

o Prior to the issuance of the plan, the FAA had underway a $130.5 million program to develop a new radar and display system to assist tower controllers in controlling aircraft and other vehicles on the ground. The system, known as ASDE-3 (Airport Surface Detection Equipment), has encountered hardware and software problems in its development and is approximately three years behind its original implementation schedule. Thirty ASDE-3 systems will be installed between 1992 and 1994. Additional ASDE-3 systems will be installed at an unspecified number of U.S. airports in the 1996-2000 timeframe. ASDE-3 equipment will replace antiquated ASDE-2 which is difficult to maintain since it is not solid state and does not function well in rain. ASDE-2 equipment is in place at 12 U.S. airports.

o Coupled with the development of the ASDE-3 radar system is an enhancement to the system known as AMASS (Airport Movement Area Safety System). AMASS will have a predictive capability that will provide automatic alerts to tower controllers when a potential ground collision situation is developing.

o The FAA plans to examine low cost surface detection technologies for airports that will not be equipped with the ASDE-3 system. A decision on which technologies to develop for prototype testing will come at the end of 1992.

Education

- The FAA is developing a variety of training and awareness videotapes for controllers, pilots, and ground vehicle operators aimed at minimizing ground traffic conflicts.

Finally, independent of the Runway Incursion Plan, the FAA announced on February 16 that the practice of directing aircraft to hold in position on runways would no longer be permitted at night or during the day when visibility was poor. This new procedure is a response to some of the factors suspected to be involved in the February 1 Los Angeles accident.

Anticipated Witnesses

Anticipated witnesses include representatives from:

- National Transportation Safety Board
- Federal Aviation Administration
- Air Transport Association
- Air Line Pilots Association
- National Air Traffic Controllers Association
- Airport Operators Council International

GROUND COLLISIONS AND RUNWAY INCURSIONS

THURSDAY, FEBRUARY 28, 1991

House of Representatives,
Subcommittee on Aviation,
Committee on Public Works and Transportation,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:40 a.m., in room 2167, Rayburn House Office Building, Hon. James L. Oberstar [chairman of the subcommittee] presiding.

Mr. Oberstar. The Subcommittee on Aviation will come to order.

On the evening of March 31, 1985, as a snowstorm blanketed the Minneapolis airport, disaster was stalking the runways. Two Northwest Airline DC-10s rolled at right angles toward each other, both under positive air traffic control; but also with the potential for civil aviation's worst tragedy, surpassing even Tenerife. With only seven to eight seconds—as he described it for our Subcommittee—separating him, his aircraft, and his passengers from eternity, Captain Donald F. Nelson decided to rotate the aircraft below the ideal speed rather than abort the takeoff roll and missed the oncoming DC-10 by some 50 feet. Disaster was averted by a highly skilled, experienced pilot who fortunately had just had some very specialized training to update his skills and knowledge of the reserve energy potential of the engines on the aircraft he was piloting.

This was a runway incursion, by any yardstick, but it was not so recorded by the FAA at that time.

In fact, the testimony to our Subcommittee on Investigations and Oversight, the FAA said that they didn't have a definition of runway incursion, so they could not classify that incident. Subsequently, the definition has been developed. Subsequently, significant attention has been paid to near misses on the ground.

Today we revisit the problem of runway incursions and on the ground collisions. Two recent accidents, one in December in Detroit and one earlier this month in Los Angeles, have focused public, industry, and government attention on this problem. Through the course of this hearing, we aim to discover what the Government and the aviation industry as a whole—the manufacturers, the airlines, the airport operators—are doing to see that they are taking every possible precaution to assure that these types of near misses and accidents are eliminated in the future.

Accidents on runways are statistically rare events when you compare the number of near misses and actual crashes on the ground to the 64-plus million operations a year. The point is that every one of those operations is under positive control. It's not like highway traffic where each individual operator is an independent agent, not under control. These are very significant events.

The incidents of runway incursions can only increase as air traffic grows and out-paces its capacity development, even out-pacing perhaps the capacity enhancement provided by the legislation that this subcommittee and the Congress as a whole approved last year, and which is now law. We may already be seeing that out-pacing of capacity with these two events coming so close to each other.

Last October, even before these two accidents, the National Transportation Safety Board, NTSB, put the problem of potential runway incursions on its "Most Wanted" list of safety recommendations, indicating that it is, in the NTSB's view, one of the most serious aviation safety problems confronting us today.

Earlier this month, the FAA issued an action plan to eliminate runway incursions. It's too early to measure the plan's effectiveness, but the FAA is to be commended for the approach taken in this plan.

First, it appears to be a systems approach to the problem. Second, we will be able to effectively monitor and judge the effectiveness of this plan in its implementation because it establishes dates, it establishes milestones, and if problems are encountered, we will know about them early on with relative ease. The plan also identifies by name who in particular at the FAA is responsible for the progress of these programs. Accountability is very important, particularly in this area.

Yet, I must reflect back on my experience of several years to say with some regret that we have seen well-defined carefully thought out plans issued in the past. Then, with a change in Administrator, they are either shelved, inadequately funded, or someone else's property, or not invented here, and nothing happens. I only have to recall the "Flight Plan for Training" issued by then Administrator Alan McArtor.

I have a feeling that under the present Administrator the agency is prepared to stay the course. I hope it is. I hope he is prepared to stay the course and to remain FAA Administrator for a time. That has been a big problem: turnover at the top.

We are keenly concerned about this issue. I assure the agency, the traveling public, and the airlines that this subcommittee is not going to let this issue quietly fade into the sunset. We've been at it in the past, we're at it today, and we'll continue to stay with it in the future. We have a list of expert witnesses that we have asked to address the question of whether ground collisions will be adequately addressed by the FAA plan and whether there is more to be done, what it is that needs to be done, and how we have to proceed.

Again, I want to assure one and all that we will stay on top of this issue because safety is our primary concern.

I want to express my appreciation to my colleague on the Republican side, Mr. Clinger, for his participation and partnership when we chaired together the Investigations and Oversight Subcommittee which delved into these issues, and for his participation and staff preparation for this hearing.

I recognize the gentleman from Pennsylvania.

[The prepared statement of Mr. Costello follows:]

Statement of Hon. Jerry F. Costello, a Representative in Congress from Illinois

Ground Collisions and Runway Incursions

Mr. Chairman, thank you for the opportunity to participate in today's hearing.

The recent increase in ground collisions, resulting in 42 deaths in the past several weeks, has caught the concern of this subcommittee. As airline travel becomes more sophisticated and traffic control equipment becomes more technologically advanced, it is disturbing to see a rise in ground collisions. Our panel is very committed to understanding the reasons behind these tragic collisions in Detroit and Los Angeles.

Investigating and ending ground collisions is one of our government's top aviation priorities. There can be no more significant transportation effort than to make our skies and runways safer. Our advanced technology should be designed to assist the people in the air traffic control towers to avoid runway accidents, and not to place less responsibility in the hands of controllers. While occasions of human error are inevitable, our aviation technology should help to reduce these instances.

This subcommittee has overseen the implementation of new technologies to help make our aviation system safer, and runway incursions may be one area where human error is the largest factor. In that case, our panel may want to investigate how air traffic control shifts might be staggered, or our controller numbers increased, to make our runway systems safer and less congested.

Our subcommittee will consider these issues and the potential improvements we can make in preventing runway accidents. I look forward to today's testimony and the results of this hearing.

Mr. **Clinger**. Thank you very much, Mr. Chairman, and thank you for calling this hearing and showing the persistence that you have shown in pursuing this issue and moving us toward a safer climate in the airports.

As you noted, Mr. Chairman, aviation enthusiasts often cite the fact that the most dangerous portion of an airline passengers' trip occurs during the drive to and from the airport. It may well be that this situation is changing; the most dangerous portion of the trip occurs during taxi to and from the terminal.

Runway incursions occur for a variety of reasons, as testimony we hear this morning will point out. Incursions typically come about not because of a mechanical failure or a systems failure, but rather due to the inability of the human actors to coordinate their actions or to understand each other clearly. To the best of my knowledge, no reliable system of computers, radars, or other devices exit that will diminish heavy reliance, now and in the future, on humans to safely direct jets while they're on the ground and taxiing to and from the terminal.

During the course of the past several years, as you have indicated, our subcommittee devoted a considerable number of hearings on the issue of increasing capacity. Our efforts were rewarded by passage of the landmark legislation last year giving airports the tools they need to construct new runways, terminals, and related ground facilities so that we can increase capacity and increase the traffic that will be using these airports. In our haste to exact greater performance, we may well have overlooked the question of safely moving jets within the airport environment.

Subcommittee attention also focused on methods of increasing capacity at airports by improving approach and departure procedures, enhancing an airport's ability to receive traffic during periods of bad weather, and other means designed to squeeze every last bit of performance out of an already saturated system of airways and airports. But once again, I wonder whether we have paid sufficient attention to the issue of safely moving planes on the ground, the subject we will pursue this morning.

Mr. Chairman, many of our larger airports suffer periods of intense and increasing congestion today, and projections suggest that growth in the system will severely test our airports and airways in the future. To me, congestion directly correlates to the probability of the potential of runway incursions.

So it's absolutely essential that the FAA begin to aggressively pursue a program to reduce the likelihood of runway incursions, as I believe they are. Steps must be taken to eliminate, to the greatest degree possible, the chance and risk of human error. I think we'll hear today that this is in large measure the cause of these accidents.

I note that the FAA, apparently in response to the recent accident in Los Angeles, has issued a runway incursion plan designed to enhance the safety of aircraft during ground movements. I think we all have to applaud the FAA for this initiative, but I think their timing is a little suspect. The record is replete with literally hundreds of reported runway incursions over the last several years. It seems to me that the FAA might have initiated this procedure much sooner than they did. But we are certainly pleased that they have now responded to this growing problem. I look forward to hearing their testimony and that of all the witnesses here today.

Thank you, Mr. Chairman.

Mr. **Oberstar**. Thank you, Mr. Clinger.

We're very pleased to have with us the Chairman of the full Committee who has committed himself to being an active participant in the activities of all the subcommittees. The Chair recognizes the Chairman of the full Committee.

The **Chairman**. I thank the distinguished Chairman.

I have no long opening statement to make. I just want to compliment you and Mr. Clinger for holding this hearing. I think this hearing is very timely indeed, particularly as we're looking to our posture hearings next week on the overall aviation issues. I want to compliment the Chairman for the outstanding job he's doing and the ranking member. I think that the safety issue is critical to our Country. I look to see what the testimony has to offer.

I thank the distinguished Chairman.

Mr. **Oberstar**. Thank you, Mr. Chairman.

Are there any other members who wish to make opening comments?

Mr. Lightfoot.

Mr. **Lightfoot**. Thank you, Mr. Chairman. I wish to compliment you on the hearing.

Just a little update as a side bar of some of the activities of this committee, a week ago Monday I was flying through the Des Moines area under their radar control. The ground controllers had alerted an aircraft to the proximity of another airplane that was in their vicinity in the air, to which the pilot asked for very precise distances, which confounded the controller somewhat. He stuttered a minute or two, and the pilot's response was, "Well, all I'm trying to do is calibrate this damn TCAS." [Laughter.]

Mr. LIGHTFOOT. So apparently we're making some progress in that area.

Mr. OBERSTAR. Our resident pilot always has good insight into human nature.

Mr. Anderson.

Mr. ANDERSON. Thank you, Mr. Chairman.

At the outset, let me thank you, Mr. Chairman, for your many courtesies in allowing me to participate in this morning's hearing. As some in the audience know, I am no longer a member of this subcommittee, but do have much interest in today's topic.

Tomorrow, it will be four weeks since USAir flight 1493 slammed into a Sky West commuter plane at the Los Angeles International Airport, LAX, killing 34 people. Unfortunately, this tragedy was only the latest episode involving one of the more significant—although often overlooked—hazards in aviation today. I'm, of course, speaking about the lethal problem involving runway incursions.

It so happened that I was on the next plane that landed at the same spot right after the crash, so I was able to see all the problems that the accident caused.

Last year, there were 267 runway incursions that were reported by the FAA, with 4 at LAX. Where the FAA's own projection of a 25 percent increase in operations at towered airports over the next decade, the problem of airport runway mishaps could undoubtedly worsen.

While today's hearing focuses on ground collisions and runway incursions, I hope we will also discuss several other significant problems within our frail national aviation system. This would include errors in human performance, congested airports, antiquated radar and communication systems, the heavy workload in air traffic control towers, and maybe most important of all, the inability of the FAA to spend down the estimated $7.6 billion in the aviation trust fund balance to help make the system safer.

Mr. Chairman, thank you for allowing me to participate this morning. I commend you for scheduling today's hearing.

Thank you.

Mr. OBERSTAR. We're always happy to have the former and first Chairman of the Subcommittee on Aviation participating in our hearings. He brings a wealth of knowledge to the subject matter.

The gentleman from Ohio, Mr. Hobson.

Mr. HOBSON. Thank you, Mr. Chairman.

I'm pleased to be a member of this subcommittee and to join with you today as we meet to listen to testimony on the problem of ground collisions and runway incursions.

This issue has recently been brought to my attention as the Congressman from the 7th District of Ohio. On February 1, 1991, at the Los Angeles airport accident, Jimmy Purdue, a 19 year old resident of my district, and a private who had just completed his training, was on his way to participate in the Persian Gulf War when he was killed in this collision along with 22 other people on that flight.

Ground collisions are extremely rare when you compare the number of aircraft flights in any given day. However, it seems that when there is an accident, it's always serious and results in a large loss of life. It's especially difficult when it's such a young person just beginning. It is a tragedy when these accidents occur. Today I want to express my sympathy to the Purdue family of Logan County, Ohio in the loss of their son.

But, Mr. Chairman, I appreciate you having this hearing today. to begin an investigation of the various technologies, procedures, visual aids, and controller aids to try to prevent such accidents from occurring in the future.

Thank you, Mr. Chairman.

Mr. **Oberstar**. I thank the gentleman for that very touching and thoughtful statement.

Are there other members wishing to be heard at this point?

The gentleman from New Hampshire.

Mr. **Swett**. Mr. Chairman, I would like to commend you for holding these hearings today. I, unfortunately, have a conflict and will not be able to remain for the full hearing, but I do want to begin this morning by giving you my perspective.

We have an FAA center in the southern part of the State of New Hampshire, and I've had the opportunity of touring that facility. I've been very impressed with the personnel and the concern that they have for the rising number of flights and the rising possibility of incursions throughout the system. It is of great concern to me that we examine these problems and that we ultimately come up with solutions that will make the system much safer.

I commend you for your interest in this area, and I look forward to working with you and the ranking minority member in pursuing solutions that must be found.

I would like to leave you with one thought. If we have any way of obtaining access to the trust fund moneys and utilizing them for solutions to these kinds of problems in the aviation system, I would be a strong supporter of that.

Thank you very much.

Mr. **Oberstar**. I thank the gentleman.

The Chair would observe that in the legislation we passed in the last Congress, there were significantly increased authorizations for funding of the Facilities and Equipment account and Import Improvement Program account. I'm very pleased to note that the administration, in the budget submission to Congress, has met all of the authorization levels with its funding requests. That's a rarity. It's the first time that it's happened, in my recollection, in 10 years.

Our first witness will be John K. Lauber, representing the National Transportation Safety Board. John Lauber is one of those extraordinarily respected voices in the field of aviation safety, one of the premier authorities in the field, a person whose judgment is highly respected. His persistence in aviation safety matters is known well beyond the borders of our own country. I greatly appreciate and commend his contribution.

Thank you for being with us this morning and for all of your work that has contributed so significantly to protecting lives in aviation.

TESTIMONY OF JOHN K. LAUBER, MEMBER, NATIONAL TRANSPORTATION SAFETY BOARD, ACCOMPANIED BY WILLIAM LAYNOR, DEPUTY DIRECTOR FOR OPERATIONS, BUREAU OF TECHNOLOGY, NATIONAL TRANSPORTATION SAFETY BOARD

Mr. LAUBER. Thank you, Mr. Chairman, for those very kind words. I'm delighted to be here to represent the Board this morning in these hearings in what has been a very longstanding matter of concern for us.

I have with me Mr. Bud Laynor, Deputy Director of our Office of Aviation Safety. What we would like to do is briefly review the testimony that we submitted and describe our concerns and interests and where we think we have come as a Nation with regard to the runway incursion problem.

As you have already indicated, this has been a matter of longstanding concern. The earliest reference that I can find within NTSB archives dates back to an accident that happened in December, 1972, a ground collision between two aircraft at Chicago O'Hare Airport. Since that time, we have issued some 40 recommendations dealing specifically with aspects of runway incursions, ground collisions, and related kinds of problems to the FAA.

Of course, 14 years ago we had the world's worst aviation accident at Tenerife, in which 583 people lost their lives in a ground collision. You mentioned the event at Minneapolis 6 years ago, which was as close a call as any of us ever want to see with missed distances estimated to be on the order of 50 to 75 feet, and truly a bit of extraordinary piloting skill saved the day in that case.

In 1985 and 1986, partially as a result of that Minneapolis incident, we at the Board conducted a special study of runway incursions in which we looked at that incident and 25 other fairly serious runway incursion incidents. That special study resulted in the issuance in 1986 of 14 additional recommendations to the FAA on such issues as pilot/controller communications, training, procedures, and the issues of signing and marking and lighting on the airport surface.

Currently we have underway at the Board three investigations involving fatal air carrier runway incursion accidents. The first of those was in January, 1990, an accident that happened in Atlanta, Georgia when an Eastern 727 collided with a Beech 100 that had landed on the runway ahead of it, but that had not yet cleared the runway. That accident was fatal to the pilot of the Beech 100.

In December of last year, I traveled with our team to Detroit to begin the investigation of the collision involving the two Northwest airplanes, the 727 taking off and the DC-9 that became lost in heavy fog during its taxi out for takeoff and inadvertently entered the active runway. There were eight fatalities in that accident. It's another accident that illustrates that a matter of inches or feet could have made a dramatic difference in the outcome because there were a total of 156 people on board the 727 and 43 people on board the DC-9. The accident, tragic as it was, had the potential for being considerably more serious than it fortunately turned out to be.

Then, of course, we had the February accident at Los Angeles in which 22 of the 89 people aboard the USAir 737 were killed and 12 people were killed on the Metroliner.

In all of these accidents that we're looking at, there are various combinations of factors that crop up including: Pilot/controller communications; airport signs, markings, lighting systems, and other elements of the physical environment that we're dealing with; controller workload; controller training; aircraft conspicuity issues; and of course FAA technical programs, which have a bearing on the issues raised by these. In addition, of course we're looking at passenger survivability issues that have been raised in these accidents.

Near collisions, unfortunately, continue to occur at a rate that I think all of us agree is unacceptable. There are two or three fairly serious events each week. The FAA totalled some 255 incidents in 1990. ASRS reports, the Aviation Safety Reporting System, tallied some 240 such events at just 20 of the Nation's largest airports. Presumably there are many others in the system as well.

I think it's a tribute to the vigilance of pilots and controllers alike that we don't have more collisions than we do. However, I think we also have to agree that the accidents that we have had underscore the fact that we can't continue to rely on that thin thread. It places an undue burden on those individuals and we need to seek better, more effective, long-term solutions to the problems. As has been pointed out, if we look to the future and the anticipated growth in air traffic, it underscores the fact that we really must get on with solving the problems of runway incursions.

Until quite recently I would have to characterize the NTSB's position with regard to FAA action as not satisfactory. We had previously stated our concerns that in the FAA RD&E programs, considerable attention was given to such issues as capacity, and although safety was mentioned, when you looked for hard evidence of specific efforts directed to the runway incursion problem, we could not find good, hard examples of progress.

Recently, however, there has been significant progress, in our opinion. There was, of course, a runway incursion task force formed. They completed their report in April of last year, which at least cataloged many of the issues of concern that must be dealt with. Of course, that culminated in the issuance last month of the Runway Incursion Plan, which appears at this point to be a comprehensive integrated plan.

As I went through and looked at the issues that will be dealt with in that plan, they include such things as visual aids—the whole question of signing and marking—and controller aids—aids and devices to assist the controllers in performing their very difficult part of the task. There is an element dealing with procedures—air traffic control procedures specifically—and several technology programs including the ASDE programs, an extension to the ASDE-3 System, the enhancements that are being addressed in the Airport Surface Traffic Automation Program and other related things. There is a significant element in the plan dealing with education of both pilots and controllers, and there is an element directed at the whole question of data collection and analysis, something that we've all felt has been wanting.

I think it's clear, on the basis of what we know about runway incursions, that the long-term solution is really going to be dependent on two fundamental thrusts. First of all, there are the things that can be done in fairly short order. Those are the low technology kinds of things. I'm referring to such things as signs, markings, paint, and other kinds of things that really don't involve a high degree of technology.

I think part of the problem there has been, due to the fact that it is necessary to pay attention to questions of international standards. Whenever you deal with international standards, that tends to take more time than I think any of us would like. But, nonetheless, there are many things that can be done even in the absence of international action that we think can move on.

The development of basically some technological solutions is necessary. Right now the system is totally dependent upon human performance. In fact, it's dependent, in a sense, upon error free human performance. We rely upon our controllers and upon our pilots to perform in about as nearly an error free way as they can.

Unfortunately, it's a fact of life that people are not error free. We have to be smart enough to design our systems—air traffic control systems or whatever—with the knowledge that people are going to make certain kinds of mistakes under certain kinds of situations, and to make the system robust so that when an error does occur, it gets caught, trapped, and corrected before we have a runway incursion, collision, accident, or an event of any other kind.

So we need to develop the technology to provide some additional backup, additional information and extension to the eyes and ears of people and to their memory, but we also need to deal with the fundamental human performance issues that are raised by all these. We see frequent instances of communications difficulties, of memory difficulties, of being subject to distraction. These are characteristic of human performance, and unfortunately, as I have said, the way the system works presently, I believe we put an undue burden on the people who operate it.

Fortunately, in addition to the Runway Incursion Plan, the FAA has recently issued the all encompassing national plan for human factors, part of a long-term effort—one major element of which is the human factors of air traffic control. I am confident that if both of these plans are in fact put into effect and we get the resources to get the work done that has been described and outlined in all of those, we will make significant progress in getting rid of the runway incursion problem and other aviation safety problems as well.

With that, Mr. Chairman, I would be happy to respond to questions from your Committee.

Mr. **Oberstar**. Thank you very much, Mr. Lauber.

I noted with particular interest your comment on page 4 of your testimony, referring to the numerous close encounters, "convince us that we are relying too heavily on perfect human performance and luck to ensure the safety of landing and departing traffic." That strikes home. It's a consistent theme that the NTSB has warned about. It's one of the first lessons I learned when I first began in this work many years ago. As you know, he was one of the most meticulous investigators in this whole profession.

We are relying on people to do it right every time and not to make a mistake. It stimulated my whole concern about human factors in aviation safety.

The fact that in one of these incidents a controller was busy trying to help one aircraft with a problem focused on the problem aircraft, forgetting that—and another aircraft had been put in position and moved again—forgetting where it was. It was perfectly understandable, but also perfectly avoidable. With the array of technology that is available today, and the kind of staffing that we know ought to take place at towers particularly, this is an avoidable kind of situation.

Just from my own experience, I was working in the iron ore mines in Northern Minnesota on the midnight shift switching trains, moving crude ore and waste rock from the pits up to the dump areas. I was at a switch point and there were three or four tracks. I had to keep track of where each train was because you could have the terrible situation of moving the track off the dump right onto the single upcoming track of a loaded train and kill a couple of people. We didn't have any training on how to do that. We didn't have any special technology. You just had to devise a little list of which train went to what area at what time.

It's infinitely more complex when it comes to air traffic control towers. And it always goes haywire when there's bad weather or when there's an incident of the nature I just described. Those are the times when the probability of deviation is highest. You reported on it.

What does this Runway Incursion Plan do about human factors? What kind of training does it propose? I've read it, so I know what it says, but I want your judgment on it. What kinds of technological redundancies, as well as human backup, can we provide in towers—between towers and TRACONs—to assure that we minimize, to the greatest degree possible, human failings?

Mr. Lauber. In reviewing the Runway Incursion Plan, one of the things that pleased me was the recognition that whoever was involved in the preparation of this plan—and I understand there were quite a few people—took human factors into consideration. It was also obvious that for one of the first times there were some human factors people directly involved. They do get at some of the fundamental issues that we raised in our own investigations and recommendations before.

For example, there are elements in the plan concerned with the development of memory aids for controllers. You referenced one of the problems as being that under the pressure of workload and other factors, controllers can easily forget. We see that so frequently in the incidents that we've looked at, that a controller forgets that he or she had cleared an airplane into position on a runway. So the plan does identify those specific issues and is going to focus specifically on coming up with solutions.

In addition, they have general educational and awareness kinds of programs. The FAA has already implemented some of these in the form of videotapes and other kinds of educational materials. One of the things that you can do, of course, and must do in any kind of situation like this, is to constantly hammer away at awareness. You have to do some consciousness raising, if you will, of the players involved, pilots and controllers alike. Of course, the FAA has developed information like that and has made use of it.

We think, too, that in the plan they address some of the other aspects. We can't just focus on the individual controller and the individual pilot because all of these perform in a context that is set by management and by the environment in which they find themselves. So there are supervisory and oversight factors, which are also significant in this whole thing.

That's what we've been trying to get at through our recommendations having to do with such things as adding a local control coordinator, for example. That is someone who is independent from the immediate control task at hand, but who has the bird's eye view and is able to bring some supervisory oversight, and hopefully is able to develop impending conflicts and intervene before they become actual conflicts.

With regard to the technological side of things, sometimes just the simple addition of information is an important one. For example, if we look at the situation at Detroit where the visibility was such that effectively the tower had no vision of the runway and taxiway environment, in effect that placed those flight crews entirely on their own for navigation. They were entirely on their own because there was no independent way for them to verify where they might be on that runway. So the addition of a simple radar display, which would show the position of the aircraft on the surface of the airport, would be a major step forward.

However, it also involves some additional human factors workload in order to make use of a display like that. I would point out that many of the incidents that we see don't happen in low visibility or at times of high workload for that matter. Many of these things are happening at other times as well. So if you look to something like a simple radar display, what that means is that you have to be actively monitoring that display in order for it to be of benefit. That is probably a less likely part of a controller's routine when the visibility is good.

So we think you have to go beyond that and add the software and the other elements to the system to develop effectively the ground based parallel to air borne conflict alert. You have to be able to track targets and to detect impending conflicts, then sound an alert to the controllers in the system that there may be a problem so that they can then intervene and prevent the problem.

I think those elements are all in the plan so far as we can see at this point.

Mr. Oberstar. I'll have further questions and come back to you with those, but I would just like to pick up on one of the elements of your response. Under low visibility conditions, should controllers be moving aircraft into position on the active runway, or should they be holding them on the taxiways?

Mr. Lauber. That's a very real issue and that is going to be something that we will take a direct look at. Certainly as a result of the Los Angeles accident, I think I would say that we were pleased with the FAA's response to basically stop the practice of putting aircraft into position at night and when the visibility is restricted so that the intersection itself cannot be seen. I certainly endorse that as a step in the right direction, and I think we'll be taking a much closer look at that issue in the Los Angeles investigation.

Mr. OBERSTAR. Certainly. At least until the Airport Surface Detection Equipment, the ASDE, or comparable more advanced radar is available to provide the redundancy. Redundancy is the key in aviation. That's the backup element for everything, whether it flies or is on the ground. I just want you to think about the adequacy of redundancy in this plan when I come back to you later.

At this point, I recognize Mr. Clinger.

Mr. CLINGER. Thank you very much, Mr. Chairman.

Mr. Lauber, thank you for your testimony.

One of the things that I was interested in noting in the Runway Incursion Plan that FAA has done is that really over the last three years most of the incursions have occurred during VFR conditions. Very few occur where visibility is limited or nonexistent. What do you think is the reason for that?

Mr. LAUBER. Well, there may be a number of reasons for it. One of the things that is difficult to discern from the data at hand is to try to understand what the traffic densities are. It is conceivable that the fact that more occur during VFR operations because there are more aircraft out and around at least at some airports during VFR conditions. So you have to normalize that. I'm not sure that I've seen data that would indicate that we have.

There may be another element in that—and this is a human performance issue—in periods where you're really dealing with low visibility, very demanding kinds of situations, it is a fact of life that under those kinds of circumstances human performance tends to be better than it is under situations where it's a benign element. It isn't a matter of anything other than that's the way people are, but we tend to relax our standards when the conditions are relaxed a little bit.

Mr. CLINGER. People aren't quite as alert, right?

Mr. LAUBER. Right, they aren't quite as alert, and they aren't quite as much on top of the situation when the situation is more benign. I think that probably explains part of it as well.

Mr. CLINGER. You've made many recommendations over the years on this whole problem. The FAA has accepted some, but I gather not all those recommendations. Are there ones that particularly concern you that have not been implemented at this point? Why haven't they accepted them?

Mr. LAUBER. I can answer the first part, and then try the second with regard to the why.

As I indicated, we've issued 39 recommendations since about 1973 on these issues. According to the tally I have, 29 of those 39 we have either closed with acceptable action or they are still open with acceptable action. There are only four of the latter that are still open, but they are classified as acceptable. We've had 10 that were classified as unacceptable action, 8 of those being closed with unacceptable action.

I think some of the ones that we had closed as unacceptable before—they go back to as long ago as 1979—when we issued a recommendation that the FAA undertake a directed safety study of the runway incursion problem and get on with identifying the problems and coming up with conclusions. That was closed as unacceptable action because they didn't take the action that we had recommended at that time. As I said, that was way back in 1979.

Another recommendation that was issued in 1984, which was closed with unacceptable action, has to do with the issues of shape, color, and other physical characteristics of the signs and markings on airports and taxiways.

Mr. **Clinger**. Let me stop you on that one because it does seem to me—as you have pointed out—that we really don't have any uniformity in this whole question of signing, markings, lighting, and so forth. Is that, in essence, what you were recommending, getting a uniform system so that there would not be confusion by a pilot going from airport to airport as to what he was looking at and what he should be doing on the runways?

Mr. **Lauber**. Indeed a large part of the issue has been standardization so that when you go from one airport to another a pilot can expect to see exactly the same kind of system to help locate himself on the surface of the runway.

In addition to standards, though, there are also some longstanding questions about the actual content and actual design of these things. How do you optimize a runway or taxiway marker so that it gives you clear and unambiguous information about where you are at that point on the surface of the airport? There are some fundamental issues in which there has been major progress made.

In fact, let me recognize the role that the Airline Pilots Association and Captain Haase, who you'll be hearing from later, has had in this effort. They have spearheaded much of this in getting an international effort underway to develop standards, but also to make certain that the design guidelines for these signs and markings are such that they're going to do the job that they need to do.

It's a two part problem. First, you have a lack of standardization. The other problem is the set of standards to begin with. Both of those need to be addressed.

Mr. **Clinger**. My time has expired, but I will have other questions as we go to another round, I assume.

I thank you.

Mr. **Oberstar**. We will indeed have another round.

Mr. **Lauber**. If I may express one further point with regard to recommendations that have not been acted upon, there's one other issue that we're concerned about, this whole issue of a full readback of clearances involving taxi clearances, which involve holding short. We are presently reviewing the current FAA response to that. We believe it's important. The FAA has not, to this point, moved forward as much as we think they should have on that. That would be the third area I would mention in response to your question.

Mr. **Oberstar**. That's a very important point, Mr. Lauber, and I appreciate Mr. Clinger raising it. There was positive readback, however—as I understand it—in the case of Detroit, but the pilot got on the wrong runway.

Mr. **Lauber**. That is basically correct, sir.

Mr. **Oberstar**. Mr. Roe.

The **Chairman**. Thank you, Mr. Chairman.

I want to welcome Mr. Lauber and Mr. Laynor to our Committee as well. I just have a couple of quick questions.

I was curious when I read your testimony. I think you mentioned on page 5 that there were a number of incidents not reported. Is there any way to measure the numbers that are not reported?

Mr. LAUBER. It is not easy to come up with an estimate on that. One of the things that you can do is compare the various databases. For example, if you take the FAA database and then compare that to the Aviation Safety Reporting System database, I believe it's correct to state that there are many more events that are reported to the Aviation Safety Reporting System. However, because of the nature of that system, the fact that it's voluntary, and the fact that none of the events reported to it are investigated, there is some question about the reliability of at least some of the reports entered into that. Once again, you're left with a very soft comparison.

I think the important point with regard to this is that the FAA has recognized the problem. The plan they have already implemented, as I understand it—or at least taking steps in the direction of—getting good definitions of what has to be reported and how it's reported and then taking steps to pull all this together in one centralized database so that we can make informed decisions about the problem.

The CHAIRMAN. So you're basically saying that we don't know.

Mr. LAUBER. I think that's a fair statement. We basically don't know.

The CHAIRMAN. The second point that occurred to me is: How closely are we working with foreign authorities on this issue?

Mr. LAUBER. I think you may hear from some subsequent witnesses. Again, I believe Captain Haase might address this. As I understand it, there is a fair amount of activity underway involving the international issues through the ICAO process. As I said, I'm not really qualified to give you the details on that, because I haven't been directly involved in it. But I understand that there is a meeting of the appropriate ICAO Committee sponsored within the next few weeks or months. International action is underway and is imminent.

The CHAIRMAN. The reason I asked that is because as we're seeing increase internationalization of the airlines, what's happening over there is important to what's happening here, and vice versa. Is there any breakdown between the number of foreign aircraft in this Country involved in either accidents or incidents as compared to American aircraft? Has that been broken down statistically?

Mr. LAUBER. Not that I'm aware of.

The CHAIRMAN. Finally, on page 9 of your statement, you make the point that you strongly support ". . . the actions taken to increase controller and pilot awareness of the problem, . . . However, we believe that the most effective accident prevention measure will be the installation of equipment capable of automatically detecting pending collision situations and alerting controllers and pilots to the need for preventative action."

Because of my lack of knowledge on this let me ask. Has the scope of the equipment and the type of equipment been defined as of now, and what would be needed to achieve that goal you have described in your testimony?

Mr. LAUBER. I think some of the basic elements have been defined at this point. What we're talking about specifically is the ASDE-3 and then the programs, the Airport Surface Traffic Automation Program and elements of that, which take the ASDE-3 as the basic radar system, develop software that then allows targets to be tracked in that system. That would then be integrated with ARTS to develop this conflict alert system.

The CHAIRMAN. Is that being worked on from a technical point of view? Are there contracts out on that?

Mr. LAUBER. These things are being tested and there are demonstration systems in effect. The first of these, as I understand it, is under test presently at Pittsburgh. I think the FAA would be more able to tell you exactly where we are with that. But, yes, there is hardware and software in hand on the testing aspect.

The CHAIRMAN. Has anybody projected what the overall cost would be to do that from an actual equipment purchase and installation and the time frame involved?

Mr. LAUBER. No, the FAA would be able to respond to the cost of that. I will note one concern that we have in that regard. If you look at the projections for the installation of the ASDE system, we're only talking, as I understand it, basically 30 airports in the Country at this point. So one of the concerns we have is whether or not that's going to be sufficient to cover all the Country.

The CHAIRMAN. If the Chairman would indulge me one more second, it seems to me that we ought to get from somebody in this field what the scope is, what the cost is, and the time frame. For a lot of things, we wait 10 or 15 years before anything is done. The operation was a success, but the patient died.

So I would hope in the hearing, Mr. Chairman, we would be able to get some more definitive information as to the scope as the time frames involved.

Thank you, Mr. Chairman.

Mr. OBERSTAR. We certainly intend to do so, and I appreciate the Chairman raising that point.

Mr. Hammerschmidt.

Mr. HAMMERSCHMIDT. I don't have any questions, but I'm delighted to see that you have this expert witness here today. We have a lot to learn from Mr. Lauber.

Mr. LAUBER. Thank you.

Mr. OBERSTAR. He certainly is the best.

The gentleman from California, Mr. Packard.

Mr. PACKARD. Thank you, Mr. Chairman. I'm a guest at your subcommittee at the present time. I serve on it for so long, and of course this is of keen interest to me personally. Because of the California connection of the last incident, I'm particularly interested.

In the review and the investigation of the NTSB with the incident at LAX, have they come up with any recommendations? If so, have they been implemented, or will they be implemented?

Mr. LAUBER. At this point, sir, we have not generated any recommendations from that accident. However, we have identified certainly the basic issues that we'll be addressing during the course of the rest of the investigation. I would not rule out our issuing recommendations. At any time that we become aware of something we feel we need to move forward with, we will do so. We have not done so at this point.

Mr. Packard. What do you feel is the most pressing need to avoid such problems in the future that are either being worked on, or needs to be worked on?

Mr. Lauber. I guess the best answer to that is that there isn't any single simple solution to any of them. If we look at all the incidents and accidents we've had, there are a variety of problems leading to these things. Each one, in a way, tends to be unique. Although there are common elements, each one tends to be, in its own way, a unique combination of those elements.

If we get on with dealing with the issues that have been raised and identified in the Runway Incursion Plan, if that is in fact put into place and significant progress is made, that will be the best thing we can do to avoid these things in the future. There are a number of things that need to be done. Some of them can be done on relatively short order and others are long-term. But the point is that we need to get on with it.

Mr. Packard. Thank you.

Thank you, Mr. Chairman.

[Mr. Packard's prepared statement follows:] Don -Folios: 56–62 - Date: 4–10–91 -Subformat:

STATEMENT OF HON. RONALD C. PACKARD

Mr. Chairman, it is a pleasure to be here with you today. As you know I no longer sit on this subcommittee, yet my interest in the topics explored is not diminished. I appreciate the opportunity to attend this most important hearing.

The recent accidents that have occurred on runways at major airports in our Nation. In addition, there have been several near misses on the ground. Safety of the flying public is a major concern of everyone in this room. I have worked hard to try and ensure safety. The TCAS legislation which I worked through this committee and the House with the assistance the Chairman Oberstar will help to prevent air collisions.

I am aware that FAA has been testing and doing research on equipment that will help to alleviate collisions on the ground. This certainly must be done and implemented at the soonest possible date.

I am afraid however that even with these additional technologies that we are not addressing the real cause of these near misses and collisions. The real cause is congestion. Currently not much if anything is being done to address this underlying concern. As the chairman and ranking member of this committee is aware, I have been working on legislation for nearly two years that will address congestion on our aviation system. I plan to reintroduce this legislation in the very near future.

I certainly feel that a hearing looking into runway incursions is extremely important at this time. I look forward to hearing from our witnesses today, especially from NTSB and FAA representatives.

Mr. Oberstar. The gentlewoman from Michigan.

Ms. Collins. Thank you, Mr. Chairman. I, too, am very pleased that you called this hearing on the runway incursions.

Mr. Lauber, you hear travelers nod their heads and refer back to the firing of 11,400 controllers in 1981 every time there is an air accident or runway incursion. Have any studies been done showing a correlation between the firing of all those air controllers and the number of accidents and near accidents?

Mr. Lauber. I don't know that there have been any general studies done of that issue, but I would be surprised if there haven't. I can address that from the point of view of what the NTSB has done with regard to the issue—

In any of the accidents we investigate that involve air traffic control, one of the issues that we automatically look at in great detail is the whole issue of controller workload, controller work force, supervisory issues, and training issues having to do with the controllers. As a general rule, I think our findings indicate that with some specific exceptions, I would not characterize controller work force as being an overriding issue in all of this. When I say specific exceptions, there are some specific facilities, for example, which we know have heavy use of overtime and other shortages. That, of course, is of concern to us.

There are also issues that have to do with such things as I had mentioned, our recommendation to create a local control coordinator position, which would be an extra position to be staffed during certain kinds of airport operations. That's a work force issue in a sense.

But my impression is that when we look at the errors and problems that are leading to incidents and accidents, relatively few of them are things that I would trace to the antecedent issue of controller work force as a general rule.

Ms. COLLINS. Even the experience or the lack of experience of controllers?

Mr. LAUBER. Yes, even the experience or lack of experience. There is nothing that steps up and suggests that this is a major issue.

Ms. COLLINS. Who would do such a study?

Mr. LAUBER. I would think that the FAA would be in a position to do something like that. In a sense, I guess you would have to say—although we haven't done a focused study specifically on that issue—collectively the findings of our investigations do constitute, in a sense, a study. Out of many, many investigations that we have conducted, we still have this impression, as I have just characterized it.

Ms. COLLINS. It seems to me, Mr. Lauber, that—since a lot of this comes down to the human factor—that more emphasis would be placed on hiring more air controllers. If, in the case of the air controller concerned with mechanical difficulties with one aircraft and forgot that they had allowed another aircraft to take off or land on a runway, it seems to me that the immediate impetus would be to decrease that workload.

And finally, I know you're talking about higher technology instruments. Being very simplistic, it seems to me that if every air controller had a map of the runways under their control, and they cleared one for landing or takeoff, it could light up so that the air controller would not forget that they had already used that runway. That runway would then be noticed by the controller so that he or she would not use it again. Do they use those kinds of devices now?

Mr. LAUBER. As I understand it, there has been a fair amount of effort to look for devices—if not exactly like that—that would accomplish that particular function. In the Runway Incursion Plan there is a device called the runway incursion device which is a device intended to do just that, remind controllers when a runway is out of service because of extended vehicle operation, like snow removal.

There has been continued development of aids to controllers, things to aid their memory and to aid them in keeping the picture in mind.

I would say that there is a fair amount of work underway with regard to that.

Back to your initial question with regard to alleviating workload by adding controllers, there is a note of caution that we have to throw in with regard to that. You have to look at an air traffic control team, say in a tower, as being a true team. They're individuals that interact with each other to accomplish the tasks at hand. The more people you put into a system like that, the more complex and more difficult the coordination between these individuals becomes. In fact, one of the most significant problems we've seen in air traffic control is the coordination between individual controllers, each of whom have a part of the task of controlling aircraft.

So I guess my bottom line on that is that we have to be very, very cautious when we think about simply adding people to the system as a solution. If we add people to the system, we may solve a couple of problems, but we may well end up creating others that are even worse. So it has to be done very, very carefully.

Ms. COLLINS. Finally, I noticed in your testimony that you're coming to Detroit in March. When, where, and what time?

Mr. LAUBER. Our public hearing on the Detroit accident has been set for March 18th in Detroit.

Ms. COLLINS. At Metropolitan Airport?

Mr. LAUBER. I'm sorry, I don't know. I'm not chairing the hearing. It will be at a hotel very near the airport.

Ms. COLLINS. Could someone inform my office?

Mr. LAUBER. We'll be happy to let you know that.

Ms. COLLINS. Thank you very much.

Mr. LAUBER. You're welcome.

Ms. COLLINS. Thank you, Mr. Chairman.

Mr. OBERSTAR. The gentleman from California, Mr. Cox.

Mr. COX. Thank you, Mr. Chairman.

As you know, the FAA and the NTSB came to a field hearing that the Government Activities and Transportation Subcommittee just conducted in Los Angeles at the airport. I'm the ranking member on that subcommittee. We had some very useful testimony on this subject.

One of the things that became clear—in particular because of our focus on the LAX runway incursion—was that that collision between the USAir 737 and the commuter plane was caused directly by the antiquated air traffic control system at LAX, specifically the 20 year old vacuum tube powered ground radar, which was broken at the time, and the airport surveillance radar, which was malfunctioning and giving inaccurate readings about the position of aircraft at the time.

I'm interested in your view to see whether it corroborates the testimony of the witnesses out in Los Angeles. If the Norden Systems Advanced Radar does what it is supposed to do, would that system have permitted us to avoid that LAX accident?

Mr. LAUBER. Well, there's not much that I can say this morning directly about the Los Angeles investigation. That investigation is very——

Mr. Cox. In fact, let me save you that trouble and rephrase the question by saying "accidents of that type".

Mr. LAUBER. Let me respond to that by saying that in that accident, and in the Detroit accident, and in others that we have looked at, one of the issues that we always address is the question of technology and where technology might have made a difference and how it might have made a difference.

The one thing I can predict with some degree of certainty, with regard to the Los Angeles accident and the others, is that when we finally determine our probable cause in that, it isn't going to be one single thing, such as technology or any other single element. My sense is that it's going to be a combination of many of the same factors that we've seen at work in other incidents and accidents that have been discussed here this morning.

Mr. Cox. Are you referring in part to the fact that, despite 11 recent cases of operator error in the LAX tower, the FAA had failed to fill an authorized controller position there?

Mr. LAUBER. I'm not part of that investigation and I can't respond to the question. I don't know the facts and details of what our team is finding there.

Mr. Cox. Let me ask if you have a view on the wisdom or not of the FAA using its existing contract tower authority to let private firms run level 1 and level 2 towers?

Mr. LAUBER. I am unaware of that ever coming to our attention in any incident or accident that we've investigated before. I may be incorrect. Mr. Laynor does not remember any either.

Mr. Cox. I recommend the subject to your future consideration. I would be interested in the views of the Board on that subject.

Mr. LAUBER. I would say that it seems to me that as part of a routine investigation involving air traffic control we would have become aware of such events if that was the case. It isn't a matter that we haven't looked at. I'm saying that there are none that have come to our attention that way.

Mr. Cox. I want to thank you and the people that came to Los Angeles for the very helpful comments at that hearing.

Mr. LAUBER. Thank you.

Mr. Cox. Thank you.

Mr. MINETA. Our distinguished former chairman, Mr. Anderson, do you have questions for the witness?

Mr. ANDERSON. Thank you, Mr. Chairman.

Mr. Lauber, my questions are going to involve the subject matter of the $7.6 billion and also the question of air traffic controllers being overworked.

I didn't see anywhere in your testimony where you discussed the trust fund, the problem involving $7.6 billion balance in that aviation trust fund. As you know, this money continues to be taken by the Federal Government from airport users with a promise that it will be put back into improving our national aviation system. Instead of using these funds to make our airports and airways safer, this money is being used by the Administration to mask the size of the enormous deficit.

What are your thoughts on this matter? Some Administration officials have told me that this money is being spent at a rate as quickly as is prudently possible. Would you agree with that?

Mr. **Lauber**. I can't respond very directly to the question because, quite frankly, the Board has never really directly concerned itself with the source of funds to solve any of the problems that we've identified. Our role is to conduct a thorough and competent accident investigation, to identify the problems that led to that accident and others like it, and to develop recommendations that we think are going to prevent them in the future. In general, we stop short of conducting either an economic analysis—although I think all of us try to do a test of reasonability, we certainly don't do a cost benefits or any other kind of economic analysis—nor do we identify the source of the funds that we think are needed to solve the problem.

So I really can't respond for the Board on that.

Mr. **Anderson**. Do you support the concept of taking the aviation trust fund off budget so that all money collected can be spent for its intended purpose instead of being manipulated into an annual budget game?

Mr. **Lauber**. I think the Board supports the notion that necessary funding to solve problems that we've identified has to be secured. Beyond that, I'm not sure that I can go any further.

Mr. **Anderson**. Many reports that I've read on the LAX runway collision touch on the heavy workload of air traffic control towers that night. In fact, records show that local and regional FAA officials had recognized for at least two years that the tower position was overworked and an assistant controller was needed to help with the workload.

Apparently, this uncommon recommendation by local FAA officials was first made following an October, 1988 incident in which a takeoff was aborted because another plane was crossing the runway. Then last July a DC–10 almost landed on top of an Airbus. Would you agree, then, that air traffic controllers are generally overworked in today's busier airport environment, especially as it might relate to the pre-1981 strike levels? What is your position on allowing controllers fired in the 1981 strike to reapply for new positions with the FAA?

Mr. **Lauber**. I'll try to respond to the several questions therein.

The controller workload is very much a focus of not only the Los Angeles investigation but others as well. That's something that we will unravel in due course during the course of our investigation and make findings and recommendations as appropriate. As a general issue, we are clearly concerned about the effective workload on performance and whether it played a role in that and other accidents. We will be dealing with those issues.

I had previously stated that as a general issue, as a global issue, my own personal view is that there are other more important issues driving the runway incursion problem than the controller workload issue. We find runway incursion incidents occurring during periods of light workload where staffing doesn't appear to be related in any way, shape, or form. In others we do, and we have made recommendations such as for the local controller coordinator similar to the Los Angeles situation. So we address those on a point by point basis.

With regard to the question of rehiring, I don't think the Board has ever taken a position on it. I will simply add, as a human performance person, that 10 years away from a very complex and challenging task is a long time to not be exercising the skills that are required to do that. I would anticipate major retraining involved to bring these people up to speed.

Mr. ANDERSON. This is not a question, but a comment.

Following the USAir crash, one of the major papers in Los Angeles reported that both planes were cleared to be in their respective positions by the air traffic controller.

If one plane has to take off from an airport at a specific spot at an exact time, and another plane has to land at that same spot, how can they not hit?

Mr. LAUBER. That's a good question. Without knowing the details——

Mr. ANDERSON. There's no need to answer, it was more an observation than a question.

Thank you, Mr. Chairman.

Mr. MINETA. Thank you, very much.

The gentlewoman from New York, Ms. Molinari.

Ms. MOLINARI. Thank you, Mr. Chairman.

Mr. Lauber, what is your best estimate as to how many additional air traffic controllers we would need in order to maximize performance at these airports?

Mr. LAUBER. I don't have an estimate for you in that regard. The recommendations the Board has made in the past with regard to this have been site specific. As I have indicated, we made recommendations, for example, for O'Hare to add this local control coordinator. We have identified other facilities—I think most of them in the Northeast, for example, where we have had some staffing problems.

Beyond that, we have made specific recommendations where we are aware of specific problems.

Ms. MOLINARI. I guess what I'm referring to more is that in your testimony you state the figures of rising increased operations throughout the system.

Mr. LAUBER. Right.

Ms. MOLINARI. I was wondering if NTSB was developing a policy to make sure that we don't—acting more in a more progressive fashion than we are all, as governments, behaving right now in terms of forecasting how many additional controllers we need and by when.

Mr. LAUBER. No, and I would also add—again, this is my own personal point of view with regard to this—meeting the anticipated growth in air traffic is not necessarily only going to be met by an increase in the work force.

One of the things that we have noted throughout our investigations of these problems is that we may be making inadequate use of the resources we have at present, but if we do a better job of training people, if we do a better job of supervising people, if we develop better procedures, better communications procedures and other things, we may well solve many of the safety problems that we've identified, and we may well also end up with some significant increases in the efficiency with which those people can move traffic.

Ms. **Molinari**. It seems to me, though, that a lot of times when we see these major incidents occurring at airports, or even just receive testimony from the controllers, it is not necessarily a case in which they are misreading a screen, but that there were at another screen, or they were assisting someone else, or that they in fact had just been working too many hours for that kind of pressure. I don't know how you can increase efficiency with the best of technologies if the person who has to interpret that to a pilot is overworked or otherwise distracted.

Mr. **Lauber**. Each situation presents its own unique demands. If you take the example that you mentioned where it's not a matter of being overloaded from looking at one display, but instead, their attention is directed elsewhere. That suggests to me immediately, that the real question is not overload, but rather has there been an optimal division of responsibilities within the team. If we have two local controllers, for example, have we done an optimum job of splitting their responsibilities so that they can each perform the tasks assigned to them and also effect the coordination that is so necessary between them?

So it isn't just the number of players, it's the rules by which those players play.

Ms. **Molinari**. So you're not willing to conclude at this point that we have an inadequate number of players?

Mr. **Lauber**. Other than the site specific and position specific issues that we have already identified, no.

Ms. **Molinari**. To rephrase it, taking the site specific and incorporating that answer into the overall program, then we are understaffed, right?

Mr. **Lauber**. To that extent, yes.

Ms. **Molinari**. Thank you.

Mr. **Mineta**. The gentleman from Illinois, Mr. Poshard.

Mr. **Poshard**. Thank you, Mr. Chairman.

I'll be brief, just to follow-up on some of the previous questions.

Mr. Lauder, I noted in your testimony that you're saying that 64 million operations at towered airports in 1990 will increase to more than 80 million operations in the year 2000, about a 25 percent increase in this decade.

Mr. **Lauber**. That's correct.

Mr. **Poshard**. Obviously traffic is getting heavier and it seems to me that human error is even more likely under this increased circumstance.

What are the qualifications for a controller? If human error is at the heart of some of these things, are we screening people who get those jobs carefully enough? It seems to me that short term memory, memorizing a lot of things and holding onto that at least for a short term is very important. Do we screen people carefully enough for those attributes? And as they're working, do we provide a certain amount of in-service training for them? What are the kinds of things we can improve upon in terms of their own training?

Mr. **Lauber**. I'm not the proper witness to respond directly to the heart of your questions. I think some people from the FAA are in a better position to answer that.

I will say that you have hit directly on issues that have been of concern to the Board for some period of time and that many of the recommendations that we've issued get to the heart of those, the question of selection and the appropriate selection characteristics for air traffic controllers.

Of course, then you have the overriding and fundamental question of controller training. We've issued a large number of recommendations dealing with what we believe are inadequacies in the training program. One example would be that we think that there has been inadequate use made of simulation in the training of controllers in general. I think the FAA has recognized that, and has taken steps to move forward in that direction. So I think we're going to see far more effective training.

Whether or not the selection program and other aspects of it are adequate would require someone to go in and take a detailed look. We have not done that and I can't respond directly to your question other than to agree with you that those are significant issues to be addressed.

Mr. POSHARD. Thank you.

Thank you, Mr. Chairman.

Mr. MINETA. Thank you very much, Mr. Poshard.

Dr. Lauber, It's always good to have you before the subcommittee.

On page 3 you make reference to the Tenerife accident. Of course, that always makes me shudder because we had something like 57 people from San Jose killed in that accident, as you will recall, having yourself been a resident of that area, because of the number of people who were on tours who were on board.

What was the weather condition; fog or something? If we had fog there, would ASDE type equipment been able to deal with that situation?

Mr. LAUBER. You are correct. The basic situation was one of fog and low visibility on the runway. One of the airplanes that had landed had to backtrack on the active runway to get back to the ramp area where they were to refuel. In the meantime, the tower had indicated to KLM that they were to hold short. However, that was misunderstood in the KLM cockpit and they proceeded their takeoff roll and of course collided with the airplane that was back taxiing on the runway.

It underscores again the point that I made earlier, that in a limited visibility situation like that, without a surface radar of some sort, there is no redundancy in the system. We are totally dependent upon the flight crews of the aircraft involved knowing precisely where they are on the surface of the runway and being aware of other traffic. There is no redundancy in the system, no independent means to verify it, and it's obviously a tragically weak link in that case and others.

Mr. MINETA. You've made 14 recommendations. You've said that several actions have taken place with regard to those 14 recommendations. Of the 14, how many have really been adopted in which action is taking place? Is there anything being done on the others? And on those where action is being done, do you folks follow-up to make sure that it is in conformance with your recommendation?

Mr. **Lauber**. With regard to the 14 specifically, I don't have it broken down that way. Overall, since 1973 we have issued 39 recommendations on the topic, 29 of which have been either closed out as acceptable action or are open awaiting acceptable action. We closed eight with unacceptable action and we have two that are open with unacceptable action.

The ones that are of current concern to us have to do with this readback issue. The taxi clearance full readback question is probably the one most important on our list.

Mr. **Mineta**. Prior to their push-back?

Mr. **Lauber**. No, any time there's a taxi clearance, particularly one involving holding short of an active runway.

Mr. **Mineta**. Pilots are sitting there with a map on their yoke and the traffic controller is giving the instructions and all they'll do is United 28, and that's it. You wonder whether or not——

Mr. **Lauber**. That's correct. There is no way for the controller or the flight crew to confirm that the substance of the message has in fact been communicated as intended.

Mr. **Mineta**. Of course, Chicago just gives it and no one acknowledges that they've heard anything.

Mr. **Lauber**. I understand, Mr. Mineta, that United has specifically directed its flight crews to perform a full taxi clearance readback in those types of situations, including the specifics. So they've moved a step ahead.

Mr. **Mineta**. Dr. Lauber, you talked about 249 in the first 11 months of 1990. I understand that 1990 ended up with 267, there were 179 runway incursions in 1988, and as Ms. Molinari pointed out, you talked about 64 million operations in 1990 climbing to 80 million in the year 2000.

Given the concerns that you have about reporting variability and whether or not this is a trend line, the fact is the traffic growth is probably going to exacerbate the problem at the airports. Do you see—given what's happening in the NASP and other things—that we will be able to deal with these issues?

Mr. **Lauber**. I think that is very much an open question at this point. It's very clear that if nothing else, the growth in air traffic is simply going to increase the number of opportunities for collision or near collision. Whether or not it adds a burden beyond that I think remains to be seen.

I think that if we look to some of the non-technical solutions that we have to address more carefully here, a good deal of that growth can be accommodated without adversely affecting the safety, in fact, by enhancing it. Let me give you an example. One of the problems that's frequently cited is frequency congestion, radio congestion at a place like O'Hare. You've heard it. You know that sometimes you literally cannot get a word in edgewise.

One of the things that we have to look for is efficiencies in performing that communication. As ALPA and others have proposed, if they were to go to a simple procedure of named taxi routes so that your taxi clearance consists of taxiway alpha to the departure runway, and that taxi route alpha becomes very much like a standard instrument——

Mr. **Mineta**. The problem at most airports is that they are like Mrs. Winchester's house. There is constant construction going on, barriers out there, temporary barriers, blinking lights, so I'm not sure they can have a plan A or B at any airport for any given length of time.

Mr. **Lauber**. If it's going to work, they're going to have to have current up-to-date charts that are kept for that purpose.

Mr. **Mineta**. You're talking about non-technical solutions. What about the technological solutions that are perhaps including in the National Aviation System's Plan, but are not being aggressively pursued?

Mr. **Lauber**. We've indicated in the past that we think that the enhancement of ASDE, for example, and some of those programs have lacked behind. I think current indications are that they are moving forward with it. We'll be watching very carefully, as will many others, to make sure they move ahead.

There are other technical issues that I'm not sure are being addressed so much in some of the FAA programs. For example, one activity that I'm aware of is something that is being done—Northwest has had a long-term interest in the use of GPS, the global positioning satellite system for navigation purposes. Even prior to the Detroit accident, they have examined the feasibility and are moving ahead to using GPS along with map displays on the electronic HSI airport surface map displays to provide a real-time airport surface navigation capability that presently nobody has.

I understand that they believe they're going to be able to demonstrate this system in the fourth quarter of this year. And there are other activities like that moving ahead and we're certainly watching with great interest.

Mr. **Mineta**. Dr. Lauber, again I want to thank you for your testimony here and the work that the NTSB does. I don't want to pull an Al Haig here and say, "I'm in charge here now," but I did. [Laughter.]

Mr. **Mineta**. It is like deja vu in terms of this kind of a hearing when I first assumed the Chair of the Aviation Subcommittee in 1981 and we had similar hearings like this. I suppose we'll have more questions of the FAA when they're before us.

So, again, thank you very, very much, Dr. Lauber and Mr. Laynor. We appreciate your testimony and we look forward to hearing you before this Subcommittee sometime in the future as well.

Mr. **Lauber**. Thank you, sir.

[Mr. Lauber's prepared statement appears on p. 129.]

Mr. **Mineta**. At this time, we have a very fine panel from the Federal Aviation Administration, headed up by Mr. Joseph M. Del Balzo, executive director for system engineering and development, FAA, accompanied by Mr. Norbert Owens, Deputy Associate Administrator for Air Traffic and Dr. H. Clayton Foushee, chief scientific and technical advisor for human factors.

It's always good to have this fine team before us. I now turn it over to you, Mr. Del Balzo.

TESTIMONY OF JOSEPH M. DEL BALZO, EXECUTIVE DIRECTOR, SYSTEM ENGINEERING AND DEVELOPMENT, FEDERAL AVIATION ADMINISTRATION, ACCOMPANIED BY NORBERT OWENS, DEPUTY ASSOCIATE ADMINISTRATOR FOR AIR TRAFFIC AND H. CLAYTON FOUSHEE, CHIEF SCIENTIFIC AND TECHNICAL ADVISOR FOR HUMAN FACTORS

Mr. Del Balzo. Congressman, thank you very much. It's a pleasure to appear before the subcommittee today.

With your concurrence, I will submit a detailed statement for the record and just summarize the highlights for today.

I believe that this subcommittee shares our belief that today's aviation system is extremely safe. My personal opinion is that it's safer than it has ever been. FAA is committed to ensuring that it remains as safe as it is today. We're doing everything we can to make it even safer tomorrow. This is an issue that has my personal commitment as well as the commitment of the agency.

But the truth is that the system is not perfect. People make mistakes, but not very often. Equipment fails, but not very often. Procedures don't always work, but not very often. Accidents do occur, but not very often. When tragic accidents occur, as they did in Los Angeles and Detroit, we're reminded of the seriousness with which we must approach the difficult task of wiping them out.

We deeply regret the tragic loss of life and the trauma of the survivors and everyone involved in that accident, including our own air traffic controllers. It's whenever accidents like those occur that we recommit ourselves to learning from those accidents so that we can assure that they never get repeated.

As I will describe, I believe that we now have an aggressive program with which we plan to drive down the incidents of runway incursions and actually reduce the possibility of an accident on the airport surface.

I believe that the Chairman was right when he said that we do now have a definition of runway incursions, but we did not have one in the past.

We've taken a number of steps to reduce their occurrence—and I'll describe them—but the fact is that reducing the threat of runway incursions is a very difficult problem, since they involve an almost infinite variety of potential situations, circumstances, and people.

We found that runway incursions are primarily caused by one or more of a combination of four primary factors: clearances, communications, ground navigation, and awareness. As recent accidents show, runway incursions represent the potential for catastrophic tragedy, a problem that requires firm resolve and committed actions from all segments of the aviation community, the government, from airport operators, from airlines, from pilots, and all individuals present at the airports.

We've recognized the need for a concerted, aggressive, systematic effort to reduce the threat of runway incursions. Administrator Busey called for a study of runway incursions. That study was completed in April, 1990. What we learned led to a more recent effort to develop a Runway Incursion Plan. That plan was finalized in January, 1991.

We talked a lot about that plan this morning. Let me tell you what it does. First, it establishes an overall program manager both to see that nothing falls through the cracks and to actually be accountable for producing timely and concrete results.

Second, we have established a quality improvement team on runway incursions to serve as a working group of agency experts to recommend solutions and priorities to the overall efforts. That's something that we cannot do alone. To ensure that we receive full input from people outside the agency, we've established under the FAA advisory committee a runway incursion working group chaired by John O'Brien of the Airline Pilots Association. Mr. O'Brien will be one of the witnesses this morning.

Third, the plan identifies 25 initiatives that are underway already this fiscal year. And each of these initiatives add an additional measure of safety.

Fourth, we're looking at a systematic review of a concept of how we actually control movement of aircraft and vehicles on the airport. Again, that's something that we can't do alone. We'll ask our runway incursion group to help.

The simple fact is that runway incursions are human errors, and those errors are shared by controllers, pilots, and by vehicle operators. Human factors, as you know, certainly play a major role in runway incursion prevention.

The agency has a new human factors plan, which addresses controller work load, scanning, and memory techniques. Long-term research has human factors at its core, as you know it must.

Automation and technology—we will provide assistance to the controller in dealing with the complexity of today's airport operation, but can't, and won't ever, entirely supplant the human element.

There's a lot underway. Let me tell you a little bit about what's going on right now. At Boston, which is completely testing of an in-pavement lighting system to allow pilots to land and hold short of the intersecting runway.

Northwest Mountain Regions and Central Region towers—as member Lauber of NTSB has said, we have installed a runway incursion device on headsets.

At Kennedy Airport we are testing systems that will initially be operated by the controller and will eventually be operated automatically. We've established an FAA industry group, and the completed draft advisory circular on low visibility ground operations will be done this March.

Fifth, we're currently in the fourth year of a three phase systematic approach to terminal automation on the airport surface. An important part of that research is an enhancement to the airport surface detection equipment, ASDE-3, to provide both oral and visual warnings to our air traffic controllers of potential runway incursions and catching those incursions before they actually occur.

We awarded a contract to Norden Systems in September of 1990. As you heard from Member Lauber, we already have a demonstration system at Pittsburgh where we are now running tests. We're installing the AMASS System, testing the interface earlier this summer. It will allow us to look at the approach path to detect arriving aircraft with the radar returns from ASDE.

The statement for the record indicates the schedules that all of these systems are working toward. We're now in negotiation with Norden Systems on the delivery schedule for the first production units of ASDE-3. You may be interested in knowing that Los Angeles and Detroit will receive their ASDE systems in July, 1992.

Let me quickly touch on airport surface traffic automation. That's an overall program that began in 1988. It has four priorities: To prevent runway incursions; to deliver identification tags to the ASDE targets so controllers can quickly identify aircraft; revise a method through Datalink MODE-S to bring surface data traffic directly into the cockpit; and it also provides an automated means to sequence departures to gain both capacity benefits in addition to safety.

We're designing experiments now to take care of low costs. We hope to be in the range of about $1.5 million a site, low cost alternatives to ASDE-3, so we can use the runway status lighting system at any airport.

The point is that we're taking a systems approach to examine how air traffic control should be accomplished on the ground. Technology changes will have a profound effect on our approach to surface movements on the airport. As a result of both the Detroit and Los Angeles accidents, universities, companies, and individuals have come forward with alternatives addressing runway incursions. We deal with them every day. Already our program manager has been contacted by over 30 firms and individuals.

I've talked a lot about technology and our statement deals a lot with technology. We talk about the ASDE-2s in place today, we talk about ASDE-3, and we talk about AMASS. Mr. Chairman, I would ask if you would agree to take four minutes on a video to show you what the performances are like compared ASDE-3 and what it would look like with AMASS.

Mr. OBERSTAR. Let's do that, yes, indeed.

[Video shown.]

Mr. DEL BALZO. That's the technology. We believe it will work, we're confident it will work, and we believe that we now have a contractor committed to delivering a quality product on schedule.

But technology is only one element of the total program. The plan that we talk about covers the full spectrum of activities. We're working to improve visual aids at airports, including standardization in signage and markings. The Administrator has already announced the commitment of $30 million in airport improvement program grant funds to test state-of-the-art advances in runway marking, lighting and signs at five demonstration airports—Boston, Seattle, Tacoma, Pittsburgh, and the new Denver airport.

We're setting aside an additional $20 million in airport grant funds to finance projects for other standardization of runway signs and other visual aids.

Yet controller aids are also being explored. Controller memory enhancement is just part of the effort. Posters, pamphlets, bumper stickers, audio tapes, video tapes—we've just taken delivery of a sophisticated state-of-the-art tower cab simulator that can simulate runway incursion scenarios to where there is a real-life element for air traffic control training programs.

In addition, both pilots and controllers will be provided with new opportunities to learn from information concerning runway incursions. We anticipate continued strong actions on all fronts to address the problems of runway incursions.

An aggressive action was taken by the Administrator on February 15th, not waiting for the cause or causes of the accident at Los Angeles to be identified, but actually taking a position to limit position and hold clearances for intersection takeoffs between sunset and sunrise or when the intersection is not visible from the tower cab.

In closing, Mr. Chairman, I would restate my deep concern over the Los Angeles and Detroit accidents. Along with the NTSB and this Committee, we will do all we can to learn from these tragedies in order to take the steps to avoid their recurrence. You can be sure that we're working aggressively and systematically to reduce the threat of runway incursions. I believe that today we are committed to doing everything that we know about as quickly and as aggressively as we can.

I feel strongly that the program I've described today—explained in more detail in my written statement—will do a lot to accomplish our important objective.

Mr. Chairman, that completes my statement and we would be prepared to respond to any questions you may have.

Mr. OBERSTAR. Thank you, Mr. Del Balzo for that summary and updating of the FAA actions on both the technology and the human factors. Obviously, considerable progress has been made. I feel a degree of confidence that I didn't have in earlier years in response to this problem. I think your plan is a good one, a solid one, but it's only going to be as good as the follow-through. That means commitment not only from the Administrator but all the way through the FAA in every region down to the controllers who have to operate the system.

I think we all understand that if you add traffic to an airport without expanding the capacity, you're going to have problems. When you have too many aircraft in the same space or too small a space, the risks keep going up. We all know what's happened to traffic. It has just exploded since deregulation. It slowed down a little bit now with the downturn in the national economy and the concern of security as a result of action in the Middle East. But the economy, sooner or later, will rebound. The Persian Gulf active conflict is drawing to a close. Concerns about security will linger, but eventually that, too, will dissipate and consumer confidence will return. Then we'll see aviation on the upswing again.

That's going to put renewed pressure on the system all over again. With the installation dates for technology that you've listed both in your testimony and that are indicated in the plan, we're going to need to see this technology introduced before this upsurge in traffic takes place. Do you expect that we're going to have traffic restrictions as we did in the period right after the firing of air traffic controllers in the summer of 1981?

Mr. DEL BALZO. Mr. Chairman, I don't believe so. If there are any traffic restrictions that we will face between now and the 21st century, I don't believe those restrictions will be based upon lack of technology, lack of procedures, or the inability to manage the airspace more effectively than we are managing it today. If there is any question at all, I think it's a question of whether or not we will have sufficient airport capacity and sufficient concrete. But in terms of technology and the air traffic control system, I don't believe that's an issue.

Mr. **Oberstar**. But at those airports where we don't have sufficient concrete and sufficient runway capacity, and the demand grows, will the FAA hesitate to hold traffic back? Do you have a plan for limiting the traffic to the capacity of that airport to handle that traffic?

Mr. **Del Balzo**. Mr. Chairman, I think you know that we operate on a principle of safety first, capacity second. We will never, never allow more airplanes to be put into that system than we believe we can safely handle. When I say, "we" that means through a function called central flow control where we carefully meter and space airplanes into and out of the system.

I say "we" in terms of local flow control in our air traffic control facilities that meter and space airplanes into the local air space. And I say "we" from an individual air traffic controller who always has the authority, and exercises it every day, when he or she feels that they cannot take another airplane safely, we expect that air traffic controller to turn it back. We'll hold their planes on the ground every time.

Mr. **Oberstar**. I want to encourage that spirit of vigilance and the unhesitating response to safety to be the mindset that prevails in the FAA, which is your hallmark as an agency.

John Lauber said earlier that the NAS plan focused primarily on increasing the capacity of the air traffic control system and the acceptance rate of existing airports. He said that only limited attention is being given to ground collisions. What is FAA's response to the NTSB observation?

Mr. **Del Balzo**. I think we have two. But I don't think there's any question that the $16 billion capital investment program for NAS plan was designed to completely modernize the air traffic control system in the United States, to take us out of the era of vacuum tubes into state-of-the-art technology.

Technology is only half of the issue. The second issue is using that technology in a way that allows us to increase safety and increase system capacity. To be sure that we implement that technology in a way that allows people—air traffic controllers, maintenance technicians—to do what people do best, and allows computers and automation to do what technology does best.

I think Member Lauber is right when he says that perhaps in the past, when our NAS plan was first being formulated, the decade of the 1980s was a decade of technology and modernization. As we now went to the decade of the 1990s with the putting together of a national human factors plan, it becomes a decade of human factors and human performance.

Mr. **Oberstar**. We've seen a very considerable increase in FAA attention to human factors. It's a very strong focus and it's great that you now have Dr. Foushee on board with the FAA. He's one of the world's renowned experts in this field. He has made really significant contributions.

In this Runway Incursion Plan, you're focusing in on controller memory. Describe for us what specific—you're outlined some highlights in your testimony, but perhaps Dr. Foushee could respond to what steps are being taken in that respect.

Then additionally, not just memory, but controller overall judgement. In these moments where they are really pressured—you have a number of aircraft coming in, you have passengers and aircraft on the ground, there's pressure to bring them in, and you have bad weather. Then you have an aircraft in the area that has a problem. Maybe he doesn't understand the language. Maybe he's dealing with a technical problem. The controller is trying to help this person in the air, you have somebody else on the ground, you have aircraft backed up behind them, and you have bad weather.

Those are the situations where the judgment, experience, and training are so critical. How are you working to enhance controller capacity to deal with it, both in terms of what I have already cited and sufficient numbers of controllers and support personnel in the camp.

Mr. FOUSHEE. Mr. Chairman, you make a number of very excellent observations about the factors that affect successful human performance in the system.

As I'm sure you are aware, we are concentrating in eight primary areas under the national plan for aviation factors to try to address these problems. I might say, before outlining them briefly that in the past we have not put enough attention on human performance issues in the agency. It's not just a question of the FAA, but also NASA, the Department of Defense, and a number of high technology industries are now realizing that they cannot afford not to pay attention to the human performance element.

But a lot of that is due to the fact that the field, and our understanding of human performance is just beginning to come of age. There have been a number of advances over the last 10 years, including the use of high fidelity simulation, that have allowed us to do a better job of determining the kinds of things that cause problems in the system.

But more specifically to your question, in the area of controller aids, there are a number of techniques for human memory enhancement that we're studying for applicability to the air traffic control operation. We're attempting to set up systems whereby people—not only air traffic controllers, but pilots—will receive much more realistic training in a safe simulation environment where they can receive feedback on how they perform and how their judgement functions in a safe environment with a realistic situation where the consequences of making mistakes has no bearing, but they can learn from those mistakes.

As I'm sure you're aware, there have been a number of advances in terms of using high fidelity simulation on the flight deck, there are programs such as Cockpit Resource Management and Crew Coordination Training that do teach judgement and teamwork. We're vigorously pursuing applications of those kinds of programs to air traffic control as well.

As I'm sure you're aware—I believe we had a hearing not too long ago on information transfer.

Mr. OBERSTAR. Yes.

Mr. **Foushee**. As I'm sure you recall from that hearing, information transfer problems probably account for 70 percent, at least, of the major problems as identified by the Aviation Safety Reporting System database.

I must also say when we get into areas associated with information transfer, they're very complicated and the answers are not always straightforward and clear. As an example, in terms of communication, the very thing that makes our language so incredibly rich and makes us able to communicate in so many different ways and convey information so effectively, also allows it to be imprecise. So we have to search for a better understanding in those areas and find techniques and methods that will allow us to minimize those kinds of misunderstanding.

But I'm sure, as you can tell from my answer, there are many, many dimensions that must be addressed for us to effectively to at least counter the human error problem, which is a part of aviation and any other high technology system.

Mr. **Oberstar**. You didn't address the question of adequate numbers of controllers, which ties into the matter of staffing standards for traffic control towers, TRACONs, or centers. In the past, I have questioned the FAA's standards for towers, particularly. The GAO studies that we have commissioned have also been critical first, some years ago, of not having a staffing standing, then as they have been developed, the adequacy of those standards.

Could you address that matter?

Or is that Mr. Del Balzo's area?

Mr. **Foushee**. I think I can address at least part of it, then perhaps Mr. Owens can comment specifically on staffing standards. The part I would address has to do with the question of how much workload is enough, and how much workload is too little. Workload and stress are kind of funny things. On the high end, it's very bad. High workload, high stress causes people to make mistakes. On the low end it's very bad as well. Low workload causes people not to be vigilant and causes people to get complacent. We see perhaps as many mistakes and human error in low workload situations, perhaps even more than we do in high workload situations.

I would also concur wholeheartedly with something that Member Lauber suggested. He suggested that simply adding more people to a system is not necessarily the answer. Again, it's a mixed blessing and it's something that is not very well understood. On the one hand, you have more resources available to you, but on the other hand, those resources are more difficult to coordinate.

I can only say that we're doing everything we can to try to study those issues in a scientifically reliable and valid way so that we can arrive at appropriate standards.

Mr. **Del Balzo**. Mr. Chairman, I would add several points. You're right that we do now have a staffing standard. Is it perfect? I would say no, and it probably will never be. I believe that staffing standard is as good today as it can be, but will continually need to be refined.

As we introduce new technology, as we continue to reduce controller workload—and I think we continue to do that— the staffing standard will continue to be adjusted.

We agree with a comment that Member Lauber made when he said that globally he believes that FAA is just at about the right staffing level for air traffic controllers. We would also agree that in unique facilities and unique circumstances we could use a few more controllers, not because we don't have enough authorization, but because they are very difficult to staff because of their locations.

I believe you know that to overcome that problem we have embarked on a demonstration program where we are providing pay incentives to keep journeymen controllers longer at facilities, and secondly as a means of attracting controllers to hard to staff locations. We've only been into that program about a year. It's too early to tell, but we're optimistic about overcoming that problem.

Mr. **Oberstar**. Thank you. I'll come back to those points later and at this time recognize Mr. Mineta.

Mr. **Mineta**. Mr. Chairman, again I want to commend you for your leadership in having these hearings on this very all important subject matter. But as I sit here reading the testimony and listening to what I've heard so far, as I said earlier, it's like deja vu.

A lot of this it seems to me—and I'll acknowledge that you have gotten out of the vacuum tubes and are now in solid state. That's an accomplishment that was made in some instances pulling and dragging the FAA along.

But one of the problems that I still feel exists out there is that you're always looking for that new equipment, the new state-of-the-art that's just coming around the corner. We never break that cycle and look at the state-of-the-art as we know it at some fixed point in time and put it into place. In the meantime, it never gets in place because you're always looking at that new piece of equipment that's just going to be coming around the corner.

It seems to me that we get recommendations from NTSB, ALPA, air traffic control organizations—we get recommendations from everybody—but we're all waiting for that piece of equipment that is going to do everything, be all for all.

I just wonder—you're talking about 1995, 1997, you're talking about 1992 in L.A. You're talking about 1994 in L.A. for ASDE–3.

Is there something we can do to tighten that up to try to get something in there? We have off-the-shelf people who are putting things into European airports and getting them into some areas. I see that happening. You're going to come up with a great piece of equipment at some point.

You gave us a time line here. First, ASDE–3 test unit is being shipped to the Tech center in July. In December a second ASDE–3 test unit will be placed in San Francisco. But we have something off-the-shelf already operating—maybe not as good as the ASDE–3 requirements—but I'm just wondering if we're not too tied to these high "standards" that never gets us to the point of having something operational.

Mr. **Del Balzo**. Congressman, I think that's a fair concern and one that I share.

I think that perhaps was a true characterization, more true, of how we did business yesterday. I would like to tell you that this is not yesterday. This is a new FAA and a new environment. We're doing things now faster than we ever did before. We are putting things in the field today and not waiting for tomorrow, and improving what we put into the field today as we wait until tomorrow.

I'll give you a couple of examples. We originally had a plan to introduce a function called pre-departure clearance on what we call a MODE-S Datalink. That pre-departure clearance would reduce controller/pilot communications workload during the pre-departure clearance function.

We decided six months ago that we don't have to wait for five years. We could introduce the function today and not wait for MODE-S, but do it on an existing communications that we don't own, that airlines lease from a private organization called ARINC. Two years ago that would have been unheard of. Today that function is already in place at three airports in the United States—San Francisco, Dallas/Fort Worth, and Chicago—and by early summer of this year 30 major airports in the United States will have that function.

I'm disappointed with how long it has taken us to get new technology such as ASDE into the system. We have a program that's running three and one-half years late.

When we embarked on this program, there was nothing available off the shelf. We went through a competition and we signed with a contractor. We should have had the system in 3 years ago. The reason we do not is technology design problems. That always happens to us in programs like this. We underestimated the software complexity. It always happens, and it always will. And then finally we ran into a manufacturing problem at the end of the program.

I think all of that is now behind us. Installations will now start, I'm confident, in December of this year. I don't know how we could do that any faster. Buying something off the shelf will not be any faster than the program we're now on. I believe that.

Mr. MINETA. You mentioned MODE-S, yet MODE-S is not going to be fully integrated as a requirement until 1995. Why is that?

Mr. DEL BALZO. The same problem. The same technology problem. We severely underestimated software requirements. The last time I looked we had underestimated that by about a factor of five. The contractor ran into difficulties, management organizational difficulties.

But, again, I think that's behind us. We have a schedule now for MODE-S. The technical problems on our programs now I believe are behind us on all except one major program. I think we have more confidence in a schedule than we've ever had before. I think we have more confidence in technology issues being resolved, and we're managing now to a cost of just under $16 billion, and we have confidence in that number as well. It's a new day.

Mr. MINETA. Tell me about the off-the-shelf ASDE-3 type system. Are those eligible to be purchased and moved around until you get your ASDE-3 on-line? If I'm an airport operator, can I go out and buy that on my own and get an FAA AIP grant, or is this something that I have to pay on my own.

Mr. DEL BALZO. The answer today is no. We have that capability for ILSs. FAA has certified a manufacturer's ILS. There is a provision for an airport operator to purchase an ILS with grant money, in return for which FAA will take over the operation and the maintenance of that system. It does not apply to ASDE-3. There is not an off-the-shelf piece of equipment that is FAA certified.

But again I would say, even if there were—and there is not—the delivery schedule that we are now on says that we will beat anyone into the field that can go out and buy what they think is off-the-shelf.

Mr. **Mineta**. But you set up your own standards and say that the off-the-shelf items don't meet our standards, and we can beat any off-the-shelf item that's going to meet our standards. I can understand that because you're setting your own standards. It may be difficult for an off-the-shelf manufacturer to meet those standards.

Mr. **Del Balzo**. I didn't mean to imply that. I'm sorry.

Assuming that there was a system available off-the-shelf that met FAA standards, I don't believe anyone could buy that system privately and beat our schedule. I could be wrong.

Mr. **Mineta**. Are the standards too high for—with every bell and whistle on it—when the urgency of the incursions dictates that we get something out there much sooner?

Mr. **Del Balzo**. I don't believe that. I believe that our standards what we believe that we need for controller operation in the system, for supply support, and a standard that allows us to build the next piece of automation, AMASS, that will provide controllers with an alert prior to a runway incursion.

You get that technology in 10 months with the schedule that we're now on. I don't believe you could buy something off-the-shelf that was not as sophisticated in less than 10 months.

Mr. **Mineta**. Then tell me what it is that is so deficient about Canada's system, about Europe's system that they have it and we don't.

Mr. **Del Balzo**. This is what I know about the system in Canada. First, the manufacturer has never built the dual sensor system. So when you look at a requirement for Los Angeles, it requires two sensors that must be integrated. That has never been done anywhere in the world with this kind of surface detection technology.

Second, Canada purchased seven systems, two of those seven systems are in a warehouse today.

Mr. **Mineta**. They're sitting in the warehouse because they're aren't technicians to install them, or because they're not working, or what?

Mr. **Del Balzo**. I believe they're sitting in a warehouse for technical reasons. I don't know that for a fact, but I believe that's true.

We have someone in Europe this week at Heathrow looking at technology that's in place in Europe. In the event that there is in fact something that's available off-the-shelf that we can buy quickly that we would find usable in the United States, then we would do whatever it is that we could to purchase and implement that technology, if we could do it quicker than what we're doing today.

Mr. **Mineta**. I know that Chairman Oberstar will probably keep a full court press on this issue because I don't want your Runway Incursion Plan, with an acronym to be RIP to be "Rest in Peace". Unfortunately, the longer we delay in implementing this into the field, we're going to continue to have the incidents as we did in Detroit and the L.A.

I know you don't want that and we don't want that. But I think somehow we have to make sure that what we can get out in the field is something that may not have all the bells and whistles that we all want in terms of being the latest state-of-the-art, but at least it's going to be doing the job.

Let me digress a minute. In Los Angeles, as I recall, on one of those runways, when you get to the halfway mark, because air traffic controllers could not visually see the airplane, the planes had to stop at some point and report that they were at that point before they could proceed on. Do you know whether that—maybe I'm not adequately describing the situation.

Norbert, could you help me out on this?

Mr. OWENS. Sure. There is a cross-over taxiway between 24 left and 25 right that passes behind some hangars. It is a non-movement area. It is an area in which the pilots are responsible for that separation. I think the controllers use the term "the 50 yard line". The pilots do report when they're at the entry and when they exit that point. They do separate each other in that area. It is a taxiway area.

The runways at Los Angeles, however, are fully visible to the controllers and the taxiway.

Mr. MINETA. The runways are, but it's just that 50 yard taxiway?

Mr. OWENS. That's right. It's on the west end of the airport.

Mr. MINETA. I believe ALPA at one point called L.A. the number one most dangerous airport. What has FAA done to make improvements there; either physical improvements that had to be made in terms of signing, or lighting, or technical improvements, technological improvements in terms of equipment, or in terms of people?

Mr. OWENS. There have been a considerable number of changes made in the Los Angeles area just in air space alone, a redesign of the TCA establishment of routes through the TCA for general aviation aircraft to easily transit that airspace. There have been some changes in the way that we——

Mr. MINETA. Mr. Owens, that really triggered something. If I recall, after the AeroMexico accident, you didn't allow any traversing of the TCA by GA, and you shoved all the GA up against the foothill.

Then there was a corridor that has been established. Has that eliminated that problem now?

Mr. OWENS. I'm not sure if it has eliminated the problem of aircraft flying at the outskirts of the TCA, but it certainly would alleviate the problem if the pilot chooses to use that. That's what it was designed to do. There are three different routes through that TCA for general aviation that are clearly defined on a map.

We've also, by the way, changed our procedures out there with a sharing of responsibilities with our facility in El Toro that has assumed some of the responsibility on Los Angeles departures. So I think we have made some significant strides in streamlining and making the operation more efficient at Los Angeles.

We did establish an assistant controller position. That came up as to the manning of auxiliary positions. I might add that assigning controllers to identified positions is the responsibility of the supervisor in charge of the shift. He makes that judgement based on current traffic conditions, the complexity, the weather, and whether or not taxiways may or may not be open.

It is a fluid situation primarily because, as Mr. Lauber said, the controllers on duty at any particular time do work as a team. There are specific standard coordination that must go on in order for traffic to flow efficiently. At any given time, if there are too many people involved, they can sometimes become a distraction rather than a help. So it is very important that it remain part of the discretion of the supervisor on duty to make those assignments.

Mr. **Mineta**. Thank you very much for being here. You have a tremendous work force down there, but it's like a lot of things around here—whether it's Congress or the Executive Branch—I think the tires need kicking every so often. It's not that I'm trying to be harsh on the agency, I just think we have to keep pressing, keeping those time lines as short as possible. Frankly, on standards, we shouldn't make them too out of reach.

Again, Mr. Chairman, thank you for your generosity in allowing me this five minutes.

Mr. **Oberstar**. This is the past Chairman's five minutes. We thank you of being here for the long experience that you have developed and the contributions you've made to aviation.

The gentleman from Ohio, Mr. Hobson.

Mr. **Hobson**. Thank you, Mr. Chairman.

Sir, I understand that you intend to install 30 new ASDE-3s. Can you enlighten me as to why it's 30 and not 32 or whatever?

Mr. **Del Balzo**. Our capital investment plan is based on cost benefit analyses, not based on how much money we have to spend, but based on the return on investment that we would get for every capital investment dollar.

Originally, we did a cost benefit analysis on ASDE, on ASDE-2. That was done in the 1970s. That cost benefit analysis at the time justified 13 as the two installations.

As we got ready for the ASDE-3 procurement—the one that we're now under contract for—we did another cost benefit analysis. This time, based upon today's traffic and the cost of each installation, we justified 30 installations.

We did that in 1987. The cost benefit analysis that we did was reviewed by GAO. GAO came back to us and said that we were much too conservative, that we did not take into account the full safety benefits from an ASDE-3 technology.

When we did the cost benefit analysis on a major airport like Chicago or New York, we estimated that an ASDE-3 would prevent one major accident every 30 years. When we did the analysis, we took into account the cost of the aircraft hull. We did not take into account the value of the human lives on that aircraft.

GAO in 1987 asked us to go back and look again at a cost benefit analysis taking into account additional safety benefits based on the cost of human life. We are in fact doing that now. It is not easy to do. I have directed that, and we are revalidating whether or not 30 is the right number in today's environment.

Mr. **Hobson**. What is your time line on the 30 that you have now?

Mr. **Del Balzo**. I don't have an answer to that today. I would be happy to provide that for the record within the next week to two weeks.

[The following was received from Mr. Del Balzo:]

ASDE–3 Equipment Delivery Schedule

[Established by Contract Mod. 0023]

Sequence location	System no.	L/R*	Disp. size/no.	Delivery date**
Pittsburgh, PA	01	L	19"/4	12/31/91
FAA Academy, OK	02	R	17"/3	06/30/91
FAA Tech. Center***	03	R	17"/3	05/31/91
Dallas, TX	04	L	17"/5	02/28/92
Philadelphia, PA	05	L	14"/4	02/28/92
Los Angeles, CA	06	R	19"/5	03/31/92
Detroit, MI	07	L	17"/5	03/31/92
Atlanta, GA****	08	L	14"/7	04/30/92
San Francisco, CA	09	R	17"/3	11/01/91
Boston, MA	10	L	14"/4	05/31/92
Newark, NJ	11	L	17"/4	05/31/92
New York—JFK	12	L	14"/4	06/30/92
Cleveland, OH	13	L	17"/4	06/30/92
Portland, OR	14	L	14"/3	07/31/92
Seattle, WA	15	R	19"/4	07/31/92
Wash.—Dulles	16	R	17"/4	08/31/92
Wash.—Andrews	17	L	17"/3	08/31/92
Miami, FL	18	L	17"/5	09/30/92
New York—La Guardia	19	L	14"/4	09/30/92
St. Louis, MO	20	R	17"/5	10/31/92
Houston, TX	21	L	19"/5	10/31/92
Wash.—National	22	L	14"/3	11/30/92
Memphis, TN	23	R	17"/6	11/30/92
Minneapolis, MN	24	L	17"/4	12/31/92
Chicago, IL	25	L	19"/6	12/31/92
Tampa, FL	26	L	14"/5	01/31/93
Baltimore, MD	27	L	17"/4	01/31/93
New Orleans, LA	28	L	14"/3	02/28/93
Kansas City, MO	29	R	17"/3	02/28/93
Anchorage, AK	30	L	19"/3	03/31/93
Denver, CO (DVX)	31	R	19"/4	03/31/93
Los Angeles, CA	32	R	—	04/30/93
Houston, TX	33	R	—	04/30/93

*L/R—Identifies the ASDE–3 system as configured for either a Local or Remote configuration.

**Date wherein the ASDE–3 hardware has completed factory test and is available for turnkey site delivery. Contract requires turnkey installation to be completed within four months of this date.

***The Denver ASDE–3 system delivery will be delayed until 03/31/93 to coincide with the delivery of the system to the "New Denver" airport. The FAA Tech Center will receive the scheduled Denver system in May 1991. It is the intention of the FAA to modify the ASDE–3 contract to replace the Denver system for full mosaic operation.

****Display size to be changed from 14" to 17" at Regional request.

Mr. **Hobson**. I have just one more question, Mr. Chairman.

Just generally, when you read about these things in the paper—and I'm a new member of the Committee so I don't have a lot of background into this—but there seems to be a prevalence of a large aircraft and small aircraft. Is there any fact to that? I've landed in small aircraft—I remember I landed at O'Hare at night in a small aircraft and the guy was so scared—the helicopters there were bigger than we were. With all those blue lights and everything going off, we couldn't get around.

It seems to me that these small aircraft, which I like to fly in, I must admit, are a burden in these incursions and create a particular problem. Am I correct in that, or is that just an assumption?

Mr. DEL BALZO. I'm not sure exactly what our analysis shows. We have done that analysis. I suspect that you are close to being right. I suspect that you would find small airplanes involved in more runway incursions than large airplanes.

The reasons for that aren't entirely obvious. One could speculate that the reasons for that would simply be that the experience is not as high, they may or may not be as familiar with airport geometry or phraseology. I suspect that you're right, but I don't know exactly to what extent. I suspect that there are some reasons that we would agree that would contribute to that.

Mr. HOBSON. But there are studies going on?

Mr. DEL BALZO. We do have an analysis, but I don't have it with me. I'd be happy to provide that for you for your own information.

Mr. HOBSON. I think that would be helpful to the Committee. If that's a major problem, it would be very helpful to us as we look forward in the future.

Mr. DEL BALZO. We'll see that the Committee receives that information.

[The following was received from Mr. Del Balzo:]

Following is statistical comparison of runway incursions involving air carrier (a/c), general aviation (g/a), vehicles and pedestrians since 1988:

	1988	1989	1990	1991	Total
a/c and a/c	29	32	42	7	110
a/c and g/a	32	28	34	1	95
a/c and vehicles, or pedestrians	27	26	19	2	74
g/a & g/a	22	23	41	5	91
g/a & vehicles, or pedestrians	19	25	35	3	82
Total:	129	134	171	18	452

Note: Operator category for aircraft involved in runway incursions resulting from air traffic control surface errors are approximate; i.e., they are categorized by use of the 3-letter designator to identify Part 121 and 135 operations. Detail may not add to total number of reported runway incursions due to breakout of categories.

Mr. HOBSON. Thank you, Mr. Chairman.

Mr. OBERSTAR. Thank you. We appreciate the points you have raised.

Mr. Del Balzo, the runway incursion device that will be installed in tower communication headsets—tell us how that's going to work.

Mr. DEL BALZO. I can describe it technically. I think your question is more operationally. I would ask Mr. Owens to address that.

Mr. OWENS. Mr. Chairman, the runway incursion device actually addresses one facet of runway incursions, generally when a ground controller would use the active runway for an activity he is in charge of, which could be an airport vehicle on the runway or a snowplow on the runway. It is a visual and an oral device, relatively low tech, that has a light when the ground controller would have an aircraft on the runway on the opposite side to show that the local controller could not use that runway. As a backup to it is a signal in the controller's ear that would say, "runway in use" so that the controller would then be reminded of it.

For other kinds of problems, like taxiing an aircraft onto the runway and then by the same controller using it for something else, it has no value.

Mr. **Oberstar**. For that device, for ASDE-3, when that comes on line, how are controllers going to be prepared to handle this technology, and what are you doing to ready them for operation?

Mr. **Owens**. With ASDE-3, when we put the automation program into it, which would provide the controller with alert information, that's the high tech solution. That's the next step solution that would address almost all the kinds of problems that we have on airport services now. The training would be very specific to the use of that equipment and the use of that software program. The controller would—much like a person coming into the facility now and being certified on a position—would go through a simulation process, be certified for the use of the equipment, and then start to use it in a real-time environment.

Mr. **Oberstar**. You'll have training at each of the towers, at each of the places that the technology will be installed, or will controllers go to some central training center, such as the Academy, or what?

Mr. **Owens**. I believe it would probably not be the Academy, but I believe that we would probably establish several regional training areas to complete that kind of simulation training.

Mr. **Oberstar**. That, of course, is the key to all this. But you have to have people trained and able to use it under these worst case scenarios.

Mr. **Del Balzo**. Mr. Chairman, I agree entirely. We have just come out of the Dark Ages in controller simulation and controller training technology. I think we are at a point now where we have a simulation capability, particularly in the tower, that matches the most sophisticated aircraft capability that is available today.

You were so kind a short while ago. If you have the patience to indulge two minutes of a videotape that shows you a tower simulator with technology that I think is the most marvelous that you will ever see. You will not be able to tell the difference between this simulation and the real world. This is how we plan to train controllers tomorrow.

Mr. **Oberstar**. Two minutes, then we'll have to take a break for this vote and come back.

[Showing of video.]

Mr. **Oberstar**. That's the kind of use of simulator that I think is so important. It's state-of-the-art and ought to be in use.

We will take a brief recess for this vote and resume hopefully in 15 to 20 minutes.

[Whereupon, at 12:15 p.m., the subcommittee recessed, to reconvene at 12:40 p.m. the same day.]

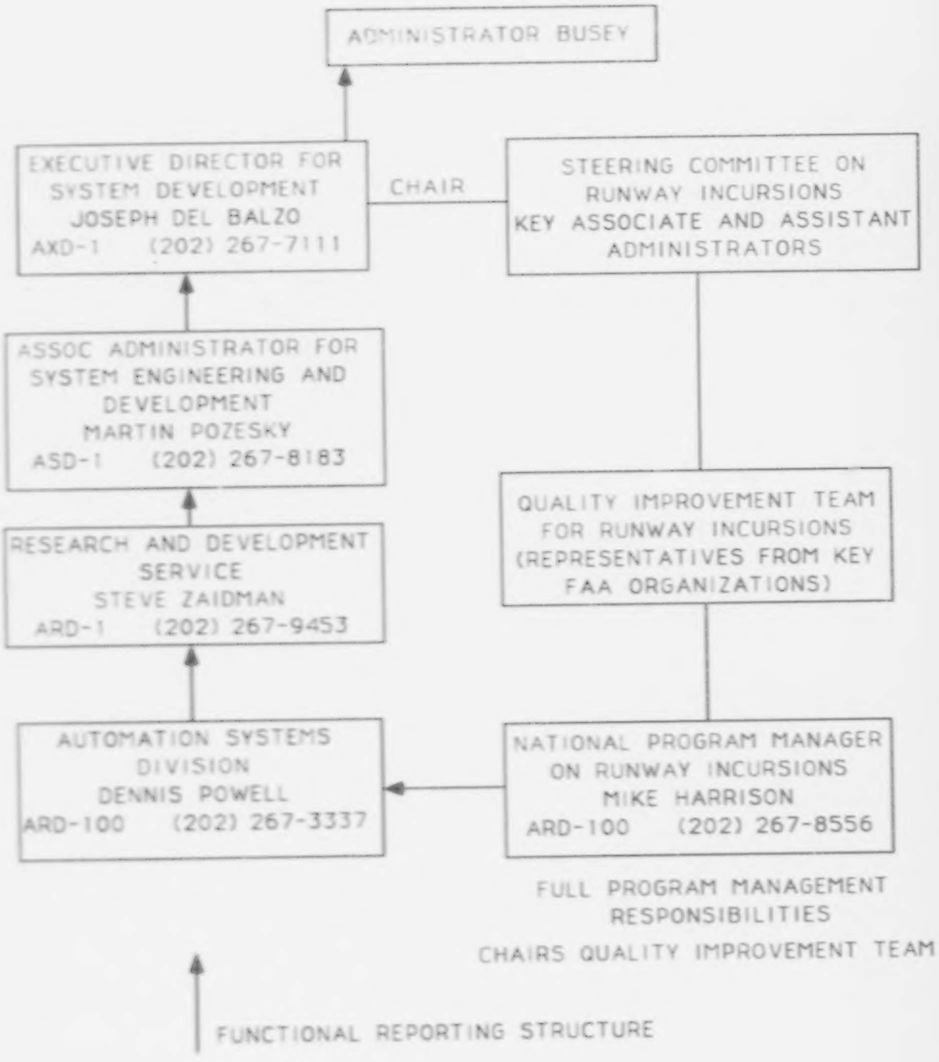
AFTERNOON SESSION

Mr. **Oberstar**. One item that's missing from your testimony, Mr. Del Balzo, is an organization plan, if you will, of the Runway Incursion Program. I'm sure you have such a table of organization internally. Is it in that overall document?

Mr. Del Balzo. It may not be in enough detail to serve your purpose. I'd be happy to submit a more detailed sketch with names.

[The following was received from Mr. Del Balzo:]

ORGANIZATIONAL STRUCTURE
RUNWAY INCURSION PROGRAM


ADMINISTRATOR BUSEY
EXECUTIVE DIRECTOR FOR SYSTEM DEVELOPMENT JOSEPH DEL BALZO AXD-1 (202) 267-7111
CHAIR
STEERING COMMITTEE ON RUNWAY INCURSIONS KEY ASSOCIATE AND ASSISTANT ADMINISTRATORS
ASSOC ADMINISTRATOR FOR SYSTEM ENGINEERING AND DEVELOPMENT MARTIN POZESKY ASD-1 (202) 267-8183
QUALITY IMPROVEMENT TEAM FOR RUNWAY INCURSIONS (REPRESENTATIVES FROM KEY FAA ORGANIZATIONS)
RESEARCH AND DEVELOPMENT SERVICE STEVE ZAIDMAN ARD-1 (202) 267-9453
AUTOMATION SYSTEMS DIVISION DENNIS POWELL ARD-100 (202) 267-3337
NATIONAL PROGRAM MANAGER ON RUNWAY INCURSIONS MIKE HARRISON ARD-100 (202) 267-8556
FULL PROGRAM MANAGEMENT RESPONSIBILITIES
CHAIRS QUALITY IMPROVEMENT TEAM
FUNCTIONAL REPORTING STRUCTURE

Mr. **Oberstar**. That's what I would appreciate having so that we can have that on track. At another date, you can come back and have a discussion of success stories of achievement in meeting the deadlines.

You said on page 7 that the ASDE-3 is 4 years behind schedule.

Mr. **Del Balzo**. Yes, sir.

Mr. **Oberstar**. Could you just tabulate the causes of delay?

Mr. **Del Balzo**. I think there are three basic causes. Initially we ran into antenna pedestal and electrical design problems that cost us about 12 months early in the program that we came across during the critical design review. Software complexity and the unanticipated growth associated with software probably cost us another 15 months. And finally the problems that we recently ran into with antenna reflective production problems cost us about another year and a half to 19 months.

The problems have now been solved. We ran into a problem with the actual shield part of the antenna de-bonding. We ran into epoxy application problems. And we ran into heat problems associated with antenna rotation causing the de-bonding problem.

Mr. **Oberstar**. Could you describe that little piece of equipment you held up there?

Mr. **Del Balzo**. This is a piece of the actual rotating antenna. As this rotates, the reflector itself had a tendency to de-bond from the metallic structure of the inside.

Mr. **Oberstar**. That's exposed to the elements?

Mr. **Del Balzo**. No, from the heaters inside and from the rotation itself, and the improper application or selection of the epoxy that was used.

That's now been overcome with a new antenna design and a new lamination process just going through the final stages of qualification testing. We think the manufacturing problem is now behind us as well.

Mr. **Oberstar**. Often I have found in my work in the Investigations and Oversight Subcommittee that the problem is with the contractor who comes along and says that they have a new idea and a new way of meeting the specifications, or they don't follow the development path envisioned in the contract. So it's not always FAA's fault. These systems are extraordinarily complex. It's not just that the agency sets a schedule and can't meet it, it's that there are some very complex technological obstacles.

Mr. **Del Balzo**. I agree that there are some very complex technological obstacles to be overcome. I think it's important that we know what the causes are; not just simply that such-and-such was so many years behind schedule, but why the schedule couldn't be met. Maybe it was too ambitious to begin with.

But it's good to have that kind of information available for us.

Mr. **Oberstar**. I agree. I agree. Let me just run through a checklist that I made of items of recurring themes in problems in runway incursion.

Coordination breakdown between the local controller and the ground controller—what are some of the problems and what are the fixes that the plan will introduce?

Mr. **Del Balzo**. Dr. Foushee can address that far better than I.

Mr. FOUSHEE. Mr. Chairman, I think as I mentioned earlier this morning, there are a number of fairly successful models that have been developed over the last roughly 10 years on the flight deck side for crew coordination training. Some of the programs are referred to as Cockpit Resource Management, or Aircrew Resource Management. There are various acronyms that you will hear about this kind of training. It is a relatively new concept. As I said, it's only been widely applied in Part 121 air transport operations within the last 10 years.

The use of techniques such as line-oriented flight training and the use of high fidelity simulators to encourage and reinforce teamwork are now becoming widespread in the industry. What we would hope to do is to develop similar training concepts—now that we are beginning to get simulation devices available for air traffic control training — to develop similar techniques for application to air traffic training as well. Although coordination and teamwork are reinforced as part of the normal on-the-job training in most facilities, we don't have a formal training program in teamwork and coordination at present, but we're working toward that end.

Mr. OBERSTAR. We had hearings last year on the problem of controller-pilot communication, focusing specifically on foreign language pilots who speak the universal language of aviation, but "speaking in tongues" much as the early church did, not really being able to understand one another.

I noted with considerable interest that in the simulation portrayed on the TV video, that the controller was speaking at a rate that even I could understand. That's not customary. When you speed that up to an operational level, it's going to be a good deal different, isn't it? Isn't that where some of the problems come in, too?

Mr. FOUSHEE. Absolutely, Mr. Chairman. Language is a very complex thing, and its very richness that allows us to convey so much information is also part of its problem.

Mr. OBERSTAR. Now, when a controller is confronted with a problem, such as a pilot who doesn't fully understand the language, a pilot who may have a mechanical difficulty or technological problem aboard the aircraft and the controller is trying to help that pilot, and then he has these aircraft on the ground—now, there has to be some cab resource management. That's what you have a supervisor for, a first-line supervisor, why you have other controllers. What sends the red flag up the pole at that particular moment, that instant, that says, "Everybody has to be on alert. All antennae up." Here's a controller who may have too many things, too many issues to handle at one time and may be distracted, because a conflict is in progress and other conflicts may arise. And that describes, at least in part, one of the incidents of earlier this year.

Mr. FOUSHEE. Yes, sir.

I don't think there's a simple measuring stick that sends the antennae up. I think the key and the underlying philosophy of the Runway Incursion Plan is that we have to maintain the proper balance of what we call people, procedures, and technology. The people have to be trained adequately. We have to do everything we can to support them in terms of appropriate staffing and their training. We have to make sure that the appropriate procedures are in place, and we have to make sure that there's some sort of backup or system that will allow any human error—and after all, we've said many times here today in many ways that human errors are not uncommon and human errors are not inherently bad; what's bad about a human error is the consequences of those errors, and what we hope to do with the procedures and the technology part is to design an adequate backup for the people who will be responsible for operating the system.

If you look at the Runway Incursion Plan, one of the first things you will notice with enhancements such as AMASS is that you still have human beings controlling surface operations, but there's an alarm or an alerting system, should they make a mistake, that will remind them that there's something they need to attend to. That's the kind of human-machine interface we're trying to promote.

Mr. **Oberstar**. Let me describe more specifically something that I have in mind.

Some years ago I observed operations at the Dallas-Ft. Worth Center. It was right at the 5:00 to 7:00 p.m. busy time. One of the controllers, with 27 aircraft on her screen, got a call, "I'm a KC–135, loaded with fuel, and I've got a fire in the tail section. I need to get out of the traffic pattern and dump fuel before this thing gets worse."

All of a sudden, people converged on that controller. The supervisor was there, the first-line supervisor, her associate controllers, and other people were watching this situation. Now, it happened that she was a developmental controller. She had a lot of support right at the time when it was needed. The system worked as one would expect it would under a circumstance of great stress. She was able to move those 27 other aircraft around so that they could provide sufficient space for the KC–135 to circle, dump fuel, and get out of trouble.

That's what I'm talking about in the cab. Particularly, you've got bad weather, you've got aircraft on the ground, you've got people coming in, you've got someone in the air who has a problem. That's when you need the most experienced people up there to sense that something is developing that is going to be a big problem. That's your area. That's the human factors side of things. No matter how much technology you have, if other folks aren't alert to the potential of a controller who is overstressed or overloaded with a situation, to come in and help out at the right time, all the other technology isn't going to work, is it? It won't do it for you.

Mr. **Foushee**. Yes, sir. I couldn't agree more. That's stated very well.

Mr. **Oberstar**. Separation criteria—what is in the Runway Incursion Plan to deal with separation criteria? Are you changing? Are you doing something different with it?

Mr. **Del Balzo**. The work that we're doing in separation criteria is being done outside of the Runway Incursion Plan. We don't envision that the new technology that we'll be putting in place for airport surface detection has any immediate implications on separation criteria on the airport itself.

As you know, we are doing some work in looking at separation standards as we introduce new technology, attempting to reduce the spacing between parallel runways on final approach for independent operations with the introduction of new technology radars.

In terms of how new technology will actually impact separation standards on the airport surface itself, that's not immediately apparent to us.

Mr. OBERSTAR. Will rapid scan radar have an effect on current separation standards?

Mr. DEL BALZO. We believe that what we have, based on the research programs that we've conducted at Raleigh-Durham and Memphis, that rapid scan radars today can support a reduction in separation standards down to 3,400 feet spacing between parallel runways. We believe that with new technology, maybe coupled to an airborne collision avoidance system, that can be driven down further, but that's yet to be proven.

Mr. OBERSTAR. Conspicuity—that falls in the rubric of "see and be seen." What does the plan envision in the domain of conspicuity?

Mr. DEL BALZO. I think the main thing that we will see in the conspicuity area will not have so much to do with visual contact and visual observations. It will have to do with the use of airborne collision avoidance systems as more and more aircraft get equipped with airborne collision avoidance systems and as we look at the different kinds of technologies that we will be introducing into the cockpit. I think tomorrow we will talk in terms of electronic VFR, "see and be seen" electronically, rather than having purely to depend on "see and be seen" by eyeball.

Mr. FOUSHEE. If I could just add to that, Mr. Chairman?

Mr. OBERSTAR. Yes.

Mr. FOUSHEE. There's a conspicuity factor in the plan with regard to runway markings standardization and lighting systems. Some of the later initiatives in the plan actually envision a system of lights that it might even be visible from the air, exactly what the status of that runway is, so it makes it very conspicuous that a runway either is or is not in use.

Mr. OBERSTAR. Signs and lighting. Signage was a problem in the last two incidents. It seems to me elemental that a pilot coming into the United States from any foreign country ought to be able to recognize the signs and the lighting system on the ground, as familiar to him as lighting and signage in his own country. Likewise, an American pilot going overseas ought to be the same. All the more, an airport in one part of the country ought to be indistinguishable from an airport in another part of the country, and yet there is variation. That may be confusing and it may be a cause of misplacement of aircraft, as apparently occurred in Detroit. There still are facts to be developed, but somehow there was a disorientation that it seems to me should not have occurred.

Mr. DEL BALZO. I think what you will hear from a lot of pilots is that lack of signage standardization that could lead to confusion. I'm sure that's a subject that John O'Brien from the Air Line Pilots Association will address.

What FAA is doing is certainly increasing the amount of inspections that are being done in airports regarding sign placement, the condition of the signs, the message on the signs. We are working with the pilots, operators, and the sign manufacturers. We have an actual industry-government team that is addressing the question of marking and signage standards. We are on a track now that says we will go to ICAO during the month of May, hoping to come back from ICAO with, in fact, approval of a new international standard which will become, obviously, the standard in the United States, and then ensuring that all airports meet the new standard as quickly as possible and ensuring that we have enough airport grant money available to ensure a rapid transition.

But I agree with you. Signage, marking, and lighting standards are a necessity.

Mr. **Oberstar**. It is a long time coming, isn't it?

Mr. **Del Balzo**. Yes, sir. Yes, sir.

Mr. **Oberstar**. And a remarkable gap in an otherwise extraordinarily advanced system of the FAA in its standards for airports, which are recognized the world over as the premiere standards for aviation.

Mr. **Del Balzo**. Another standardization issue that I think you will hear from pilots has not so much to do with size and color and lettering and location. I think that's pretty well consistent. It has more to do with the content of the message on the sign. I also think that has a lot to do with the subject that we talked about earlier today, as to whether or not we can standardize routing and taxiway instructions, routing and taxiway names. If you go to one airport you will be faced with "taxi in or taxi out" and you go to another airport and it will be the name of a person.

What we are trying to do with the new standards is to in fact achieve some standardization in nomenclature.

Mr. **Oberstar**. That is an intermodal problem in the Department of Transportation and one with which I've been familiar for some 16 or 17 years. The Subcommittee on Investigations and Oversight sent its top investigators, who had been in the highway program for almost 20 years, out to review signage on the Interstate Highway System, which is supposed to be uniform across this country.

We sent them out to a newly-built section of Interstate, not yet open to traffic, one which they selected, and they could not get to the destination point that they had selected using the signs which were on this not-yet-opened segment of Interstate. That is terrible. On the Capital Beltway, our investigators were out checking traffic, just stopping people and talking to them. They found a woman who was hysterical. She had been on the Beltway for eight hours. [Laughter.]

Mr. **Oberstar**. She got off only to refuel her automobile and got back on.

Now, this case is in one of our hearing documents. It's fully documented with name and automobile. It was because of the signs that are so terrible.

You know, we don't even have reflectance standards for signs on the Interstate Highway System. We don't have standards for them.

So the FAA is leagues ahead of your sister agency, the Federal Highway Administration. And when you complete this project, we're going to send Dr. Larson over to take lessons.

Mr. **Del Balzo**. Thank you. [Laughter.]

Mr. **Oberstar**. The gentleman from Ohio.

Mr. HOBSON. Mr. Chairman, just one aside. As a freshman, I can tell you that the highway system is still a problem. My wife and I are having trouble getting around here, so it hasn't changed a whole lot from when you did your investigation.

The only other comment I might make is that I feel astounded that, with all the high tech we have, there is still a problem. But I guess blue lights mean the same everywhere on the ground, and the lighting is pretty much standard, isn't it, wherever you go?

Mr. DEL BALZO. Yes, sir.

Mr. HOBSON. But it's the signs—not the color, but what's written on the signs?

Mr. DEL BALZO. It's the message on the sign. It's not the color, it's not the location. It's the actual message that is on the sign.

Mr. OBERSTAR. I will—from your standpoint, mercifully—conclude at this point by quoting from our 1985 hearing. Captain Nelson was a Northwest Airlines DC–10 pilot: "I would have to say it was my good fortune to have been involved in training and the development of procedures and engine work, where performance is carefully figured and involved, and probably what you have reference to is our Northwest Airlines work on low-level windshear and what you refer to as maximum performance escape procedures. All of that tended to give me a comfortable feeling or comfortable background that allowed me to draw on some of that experience. It was my good fortune. We've been relying a little bit too much on luck; perhaps too much on perfect human performance." That is a statement from our hearings in June of 1985.

I have a sense that this Runway Incursion Plan is going to move us a good long step away from luck and reliance on perfect human performance every time, to a support system that will compensate.

Mr. DEL BALZO. Yes, sir. We're committed to that.

Mr. OBERSTAR. We will be watching your commitment.

Thank you very much, Mr. Del Balzo, for being with us, and Mr. Owens and Mr. Foushee, and your whole backup staff.

[Mr. Del Balzo's prepared statement appears on p. 95.]

Mr. OBERSTAR. Let's proceed to our next panel, consisting of Mr. Roger Fleming, Senior Vice President, Technical Development and Planning of the Air Transport Association; Mr. R. Steve Bell, President of the National Air Traffic Controllers Association; Captain David Haase, Chairman, Executive Central Air Safety Committee of the Air Line Pilots Association; and Mr. Siegbert Poritzky, Senior Vice President, Airport Operators Council International, speaking also for the American Association of Airport Executives.

Gentlemen, welcome. Thank you very much for being with us and for listening patiently to our previous testimony.

Mr. Fleming, would you proceed.

TESTIMONY OF J. ROGER FLEMING, SENIOR VICE PRESIDENT, TECHNICAL DEVELOPMENT AND PLANNING, AIR TRANSPORT ASSOCIATION; R. STEVE BELL, NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION; DAVID HASSE, CHAIRMAN, EXECUTIVE CENTRAL AIR SAFETY COMMITTEE, AIR LINE PILOTS ASSOCIATION, ACCOMPANIED BY JOHN O'BRIEN, DIRECTOR, ENGINEERING AND AIR SAFETY DEPARTMENT; AND SIEGBERT B. PORITZKY, SENIOR VICE PRESIDENT, AIRPORT OPERATORS COUNCIL INTERNATIONAL, ON BEHALF OF AMERICAN ASSOCIATION OF AIRPORT EXECUTIVES

Mr. **Fleming**. Thank you, Mr. Chairman. I will, and in the interest of brevity I would ask that you include my complete statement in the record.

Mr. **Oberstar**. Without objection, so ordered.

Mr. **Fleming**. Thank you, sir.

The accident which occurred at Los Angeles on the 1st of February served as a reminder that the FAA and all the rest of us in the aviation community still face a considerable challenge to identify and implement a comprehensive, integrated, and systematic set of measures to significantly reduce the chance of collision on the ground between aircraft or between aircraft and other objects.

Mr. Chairman, the ATA and its member airlines have been mindful of the risks of ground collision for some years. As you know, we have been very actively engaged with FAA, ALPA, and others in the perfecting of the TCAS system, which is being installed on airplanes to reduce the risk of midair collision. We have been concerned that we have not done enough to avoid that possibility on the ground.

Each year the airlines establish a safety agenda which governs their work priorities and programs for the year. The first item on this year's agenda is called out in the cover page, and it reads, "Consideration of new procedures and equipment that could help prevent runway collisions, including improved communications procedures, standardization of markings, lighting, and signs for airport runways and taxiways, and installation of standard taxi routing and surface detection equipment."

With your permission, Mr. Chairman, perhaps a copy of the full safety agenda could be included in your record.

Mr. **Oberstar**. How long is that document?

Mr. **Fleming**. It is a total of six pages.

Mr. **Oberstar**. I see. Without objection, the document will be included in the committee hearing.

Mr. **Fleming**. Thank you, sir.

[The safety agenda referred to by Mr. Fleming follows:]

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IMMEDIATE RELEASE

AIRLINES SET SAFETY AGENDA FOR 1991

WASHINGTON, D.C., January 22, 1991 -- U.S. airlines and their trade association will pursue a 45-point program this year to improve the safety of air travel, the Air Transport Association announced.

This year's program is described in the ATA Safety Agenda for 1991 (see attached). ATA establishes such an agenda every year to help guide airline and government activities throughout the year that relate to safety.

This year's agenda includes the following activities:

* Consideration of new procedures and equipment that could help prevent runway collisions including: improved communications procedures; standardization of markings, lighting and signs for airport runways and taxiways; and installation of standard taxi routing and surface detection equipment.

* Exploration of new concepts for containing parts of engines that have failed or for increasing aircraft tolerance of damage caused by uncontained engine failures.

- more -

- Deployment of additional Doppler radars and other ground-based systems for detecting windshear conditions and for giving advance warning of such conditions to flight crews.
- Exploration of ways to improve flight crew training related to rejected take-offs.
- Implementation of the National Plan to Enhance Aviation Safety Through Human Factors Improvements. This plan, developed jointly by industry and government, is a blueprint for reducing human error in aviation.
- Examination of DOT rules regarding carriage of the handicapped to ensure the rules satisfy the legitimate needs of handicapped passengers **without** degrading safety.
- Implementation of minimum hiring standards and training procedures developed last year by the airlines for airline security screeners.
- Exploration, with government officials, of better ways to measure aviation safety.

"These are just a few examples of the dozens of activities ATA will pursue with its members in the coming months to improve safety," William Hoover, ATA executive vice president, said.

"The airlines are truly committed to making what is already an excellent safety record even better," he said.

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#8 1-22-91

Attachment

ATA SAFETY AGENDA FOR 1991

Safety of Flight Operations

A. Reduce risk of mid-air or ground collision

1. Conduct an operational validation of TCAS II and perform an analysis utilizing a significant fleet sample. Seek prompt resolution of certification and implementation schedule issues. Work cooperatively with FAA and other industry bodies to incorporate results of evaluation into TCAS specifications.

2. Undertake action to ensure that air carrier aircraft arriving and departing airports with ARSAs will be operating in airspace requiring automatic altitude reporting equipment for all aircraft.

3. Seek ATC system enhancements that will provide VFR Mode C intruder conflict alert service and conflict resolution advisories for terminal and enroute controllers prior to implementation of the Advanced Automation System.

4. Participate with FAA in assessment of key terminal areas to identify equipment and personnel requirements as well as airspace modifications and operator and air traffic procedural changes to reduce operational errors.

5. Seek government/industry solutions to reduce incidence of runway incursions that might cause collisions on the ground, including delivery and acceptance of taxi instructions and use of airport surface detection equipment.

6. Develop Enhanced Vision Systems Technology to improve the aircrews' performance in approach, landing, rollout, taxi and takeoff phases of operation in night and adverse weather conditions.

7. Identify and pursue an action plan to improve pilot/controller communications discipline with specific near term emphasis on readback errors. Pursue expanded use of data link.

8. Seek full capability precision approach systems for new and existing runways so as to provide the highest level of safety.

9. Encourage development of enhanced ground proximity warning systems with appropriate procedures and supplemental training.

10. Encourage development of industry training media to include human factors, accident/incident lessons learned and other mishap information which goes beyond basic narratives. Utilize ASRS data base and other sources.

11. Seek techniques, technologies and procedures which will provide aircraft separation for oceanic areas utilizing automatic dependent surveillance and closer spacing for precision approaches.

B. Ensure Continued Airworthiness of Aircraft

1. Ensure continued airworthiness throughout the operational life of aging aircraft by aggressively pursuing enhanced corrosion control repair procedures, non-destructive inspection, advanced indicating and monitoring systems, maintenance/inspection human factors, and data interchange techniques and technologies. Also, facilitate industry efforts to assure an adequate future workforce.

2. Implement the design recommendations of the systems review task force to ensure preservation of redundant safety of flight critical functions.

3. Develop improved engine containment design concepts and aircraft designs that are more tolerant of uncontained failures.

4. Develop an industry data base to anticipate and support the airworthiness requirements of the air transport fleet.

C. Reduce severe weather risks

1. Work actively to achieve additional projected deployment of improved and expanded windshear ground sensing capability (LLWAS and Terminal Doppler) and development and implementation of better means of communicating windshear and other severe weather warning messages to pilots.

2. Stimulate the development of airborne windshear, wake vortex, and clear air turbulence detection equipment which provides pre-entry warning information to the cockpit.

3. Introduce new aircraft ground de/anti-icing fluids, equipment and procedures and develop icing forecasts to extend aircraft protection during winter operations. Ensure compatibility with aircraft structure and operational procedures. Continue support of R & D to develop validated hold-over times for representative atmospheric conditions.

4. Identify a course of action aimed at reducing the number and frequency of inflight turbulence injuries.

D. Improve Flight Crew Performance

1. Ensure implementation of Joint Task Force Flight Crew Performance recommendations for pilot training and checking. This should include the development of guidance material and rulemaking for the Advanced Qualification Program, LOFT, and CRM, and to permit the application of modern technological advances in computer based instruction and training devices.

2. Seek methods to assure safety and reliability in decision making related to rejected take-offs. Investigate the benefits of takeoff performance monitoring systems.

3. Encourage the implementation of Digital Flight Data Recorder Monitoring Programs to identify and correct deficiencies in pilot training programs, ATC procedures, or other operational issues and at the same time provide appropriate crew identification and enforcement safeguards..

4. Implement the program elements and seek continued federal funding to support the National Plan to Enhance Aviation Safety Through Human Factors Improvements focusing on needs identified therein. Foster cooperation between FAA and other organizations to achieve the objectives of the National Plan.

5. Ensure that design decisions with regard to cockpit technology are compatible with and will augment the capabilities of the flight crews.

6. Encourage efforts to enhance the quality, experience and quantity of future air carrier pilot candidates.

E. Reduce Hazards to Flight

1. Maintain programs to promote U.S. air safety through passenger and shipper awareness of dangerous goods restrictions applicable to baggage and cargo.

2. Encourage FAA enforcement of regulations regarding undeclared and unidentified hazardous materials shipments.

3. Oppose construction of tall structures in approach/departure areas and the imposition of local airport noise restrictions which require significant close-in maneuvering or power changes.

4. Examine the benefits of an automated industry safety data base, pertinent to the operation of air carrier aircraft, that would provide for the collection and availability of airport data, including bird hazard information.

5. Provide Industry guidelines/solutions for use of electronic devices in airline passenger cabins.

II. Improve Safety in the Cabin

A. Encourage the required research to determine the standards for safer crewmember seats and infant/child safety restraints.

B. Ensure DOT rules regarding carriage of the handicapped satisfy legitimate needs of handicapped passengers without degrading the level of safety afforded all passengers.

C. Reduce the danger potential of fires.

1. Investigate possible causes of fire penetration of cabin interiors to determine effective design changes to minimize that fire hazard.

2. Evaluate FAA/CAA Industry cabin water spray equipment designed to reduce the threat of fuel-fed fires into the aircraft cabin.

3. Evaluate FAA/Industry R & D conducted to determine methodology to locate hidden fires.

III. Strengthening FAA/Industry Security and Anti-Terrorism Measures

A. Seek effective and operationally viable explosives detection equipment.

B. Guide selective introduction of the initial FAA-approved explosive detection systems for limited operational application.

C. Press for full implementation of the industry's enhanced airline passenger screening training and screener qualification and selection programs.

D. Promote a joint FAA/industry security recognition and award program for exemplary performance on the part of individuals, companies or airlines.

E. Continue the expanded airline program of testing the screening process.

F. Guide airline participation in government and industry implementation of the recommendations of the President's Commission on Aviation Security and Terrorism and the provisions of the Aviation Security Improvement Act of 1990.

IV. Improved Safety Data and Safety Program Management

A. Implement an automated industry safety data base that would permit collection, analysis and dissemination of timely accident/incident information.

B. Cooperate with government and industry to identify improved indicators of the current level of safety in the air carrier industry. Insure ATA safety objectives are included in FAA safety priorities.

C. Support the need for highly competent, well trained FAA inspection and safety personnel working in concert with airline, manufacturers and other government participants to foster safety and continued airworthiness.

V. Increase Public Awareness of Airline Safety Programs and Accomplishments

Continue a strong public information program to assure broad understanding of the airlines' highest priority commitment to safety and the safety activities of the industry. This program is to be conducted in conjunction with efforts to increase public and Congressional awareness of the need to enhance safety and expand the capacity of the nation's airports and airspace facilities through modernization. Demonstrate that cooperative airline, manufacturer, government participative efforts are a more productive means of assuring airworthiness safety than enforcement actions.

Mr. Fleming. NTSB reports of their investigations of ground accidents, runway incursion reports, and special FAA and NTSB studies of ground safety issues all reveal one common and significant thread, the possibility of human error on the part of pilots and controllers. And, of course, we have heard extensively about those problems from Doctors Lauber and Foushee this morning, and I will not elaborate any further on the points raised in my statement.

Dr. Lauber, in testimony last year before another subcommittee, noted that basically the system, the way we're operating it, demands nearly error-free performance, and that just isn't the nature of the beast. Human beings are subject to various kinds of errors in various situations, and the challenge is to design a system—an air traffic control system, in this case—which is tolerant of those errors when they do occur, and which detects and traps them before we have near collisions or, quite obviously, actual collisions.

I was very pleased this morning during testimony by Dr. Lauber and then by Mr. Del Balzo and Dr. Foushee of FAA to hear about the emphasis being placed upon the human factors issues, specifically the possibility of error by controllers and pilots and means to provide backup or redundant capability to reduce the chance of that error resulting in a fatal accident. Dr. Lauber's words last year, which I cited in my testimony, were certainly prophetic in light of the accidents at Detroit and Los Angeles.

The FAA's Runway Incursion Plan, we think, represents a promising approach to address the challenge at hand. I believe that virtually every one of the questions and issues that I posed in my paper, which will be in your record, has been addressed either in the Runway Incursion Plan or by Mr. Del Balzo's and Dr. Foushee's explanation of what they intend to undertake.

In the near term, Mr. Chairman, FAA has clearly undertaken the initial steps to implement the action program outlined in the Runway Incursion Plan. I think there seems to be general agreement that emphasis should be placed on the set of issues related to airport signage, marking, and lighting, and to any additional improvements that could be made to controller and pilot training programs and the possible procedural safeguards that might be introduced or reinforced in the short term. I was particularly pleased, as were you and your colleagues, to see the demonstration of the new controller simulation capability. That capability, as you well know, is widely employed in the airline industry at this time, and has been for some years, and largely at the instigation of Doctors Lauber and Foushee and their fellow human factors researchers. We are pleased that FAA is now seeking to adapt that approach to training and employ it in the controller training programs as well.

Another obvious short-term measure that needs to be taken—again I think FAA is pressing for this solution—is to complete development of the ASDE-3 system and the Runway Incursion Warning Module that they intend to implement in connection with that equipment.

In the longer term, the automation of the airport surface traffic management functions is clearly a task that is going to require a dedicated effort over a prolonged period. As the FAA witnesses described the development of ASDE in stages 1, 2, and 3, they are comprehensive and I think they are a systematic approach to automating that function.

Government and industry together need to aggressively pursue the human factors initiatives identified in the human factors plans. Adequate funding and other resources must be supplied, and there needs to be a commitment to implement the lessons learned. I think if we could be critical of ourselves over the long term, it is very difficult to sustain programs like human factors, especially when budgets are tight, because they are viewed by many as "soft sciences" and rarely produce immediate effects. But if you look at what has happened in airline training programs over the period of 15 years or so, we have made enormous strides, and it is clearly possible for FAA to do the same thing.

Another important set of problems must be addressed, and those concern the inordinate complexity of the government procurement rules under which FAA and other government entities must operate. This committee, in conjunction with airport-airway reauthorization legislation last year, supported steps to begin addressing ongoing procurement problems. Nevertheless, the shortcomings and complexities of that process contribute to the lengthy period of time required to procure and install complex systems.

Far-reaching procurement reform is essential if FAA is ever to be able to implement safety and capacity enhancements in a timely manner. You referred again this morning to the frustrations that you and your colleagues have experienced in connection with the length of time it takes to get a system like ASDE implemented in the field, available to the controllers, and with the bugs worked out of it so that the controllers have confidence in the ability of the equipment to work effectively and not create additional problems.

That, Mr. Chairman, I think is one of the more vexing problems that we need to address—not necessarily in this hearing, but in future undertakings—as we attempt to improve the implementation of new technology and other safety enhancements in the system.

Thank you, Mr. Chairman.

[Mr. Fleming's prepared statement appears on p. 108.]

Mr. OBERSTAR. Thank you very much. I really appreciate your testimony.

Mr. Bell?

Mr. BELL. Mr. Chairman, NATCA welcomes this opportunity to testify before the subcommittee on the critical issue of runway incursions.

As the chairman is aware, NATCA is party to the NTSB investigation of the recent incident at Los Angeles Airport, and as such, we are not at liberty to discuss the specifics of that accident nor to speculate on its causes. However, we do hope to bring to light some nationwide problems that lead to runway incursions and some possible solutions to them.

The issue in our opinion, sir, is really one of capacity versus safety. The FAA is trying to milk the airspace for every possible new operation, while in our opinion giving scant attention to the problems of managing a safe and efficient flow of ground and local traffic.

NATCA contends that staffing is the principal root of the runway incursion problem, and boosting staffing is the fastest and easiest way to bring order to this bedlam. Contrary to FAA's statements, the air traffic control system is not rebuilt to pre-strike levels. We are still short approximately 3,000 full performance level air traffic controllers.

What we need today are extra eyes in the tower cab in the form of assistant local controllers and supervisors who are managing operations rather than working traffic and/or training. There is no replacement for the skill and diligence that a full performance level controller can provide, and that includes equipment and technology.

Airport Surface Detection Equipment, also known as ASDE, is being touted as a cure-all to runway incursions. NATCA believes that ASDE's capabilities are being oversold. ASDE–2, which is now in operation, is only a poor-to-fair piece of equipment, in our opinion. Sometimes it splits one large target into two, and it is unreliable during bad and inclement weather.

On paper, ASDE–3 would seem to be a marked improvement, especially with the add-on Collision Alert Warning System. However, from the reports we have received, the equipment is still riddled with bugs, such as large aircraft producing as many as four separate targets.

The ASDE Conflict Alert System is also worrisome, given the past performance of other conflict-alert technology. If the ASDE system is always crying "wolf", controllers will not look upon it as a valuable tool, but rather as another example of unreliable FAA equipment not living up to the promise.

We also wonder how much time the ASDE–3 Conflict Alert System will give the ground or local controller to react. Will ASDE–3 prevent an accident, or will it just sound an alarm to announce that an accident is already in progress?

Given the dearth of FPL controllers, procedures and airport layout become even more crucial. NATCA strongly supports efforts by the Air Line Pilots Association to standardize signs, lighting, and markings at airports. Many of our airports are baffling places to negotiate, especially at night, when the runways and taxiways become a sea of lights.

Communications between controllers and pilots is also a problem. We appreciate ALPA's suggestions, mandating readbacks of all clearances and eliminating the use of multiple frequencies by a single controller during times of limited staffing. However, we believe these are not feasible because of limited staffing and the number of operations that controllers are forced to handle.

Communications with foreign carriers and general aviation pilots can also be a major concern, as they often require greater attention in the air and on the ground. This places an increased workload on controllers, who must still handle other operations. There should be some sort of testing mechanism for foreign carriers and general aviation pilots to ensure proper phraseology and frequency discipline.

In conclusion, runway incursions are not going to go away overnight. The FAA and Department of Transportation have taken a piecemeal approach to the problem. Once again, they believe that technology will be their salvation. However, ASDE technology is only one part of the solution and could be part of the problem if we do not have enough full performance level controllers in the tower cabs to provide the experience and vigilance that air traffic demands. It is through more FPL controllers, reliable equipment, improved communications, pilot-controller awareness of the problem, procedures that place safety before capacity, and simplified and standardized signs that we can lick runway incursions. Halfway measures will perpetuate the problem, and halfway measures are all we have today.

That concludes my short statement, sir.

Mr. **Oberstar**. Thank you very much, Mr. Bell. We appreciate your contribution.

Captain Haase.

Captain **Haase**. Good afternoon, Mr. Chairman. I am David Haase, Executive Central Air Safety Chairman for the Air Line Pilots Association, a member of our pilot volunteer safety structure. I am accompanied this afternoon by John O'Brien, who is Director of our Engineering and Air Safety Department.

I would like at this time, in order to provide a more "real world" perspective to the problems and the potential solutions that we see, to depart from my prepared statement and offer some comments for the consideration of the committee.

In December, 1972, I, as a First Officer in a Convair 880, was taxiing out at Chicago O'Hare next to a North Central Airlines DC-9. In deference to the aircraft to our left, we elected to let him go first, out to the runway. He was cleared for takeoff. Some few minutes later, we taxied into position to hold. The tower called us back and said, "Would you see if you can contact North Central? We can't seem to raise him on departure control." That was the Delta-North Central runway incursion accident in Chicago in December of 1972. That was kind of my introduction to the subject, if you will.

I guess we're more concerned about it in some ways because we always seem to get there first. But we would also point out that airport capacity problems exacerbate the runway incursion problem. The two seem to be very much linked together.

What has changed over the years since 1972 from the pilot's perspective? Seemingly, very little, but in reality there has been a lot of background work done. We have a problem with implementation. The question is, how do we get ahead of these problems instead of reacting to them after the fact, after another tragedy?

First off, if we look at the definition of a runway incursion which the FAA uses today, we feel it is insufficient because it talks about "an unauthorized runway entry which causes a collision hazard." On the other hand, we believe the definition should indicate strictly an unauthorized entry, whether or not a collision actually was caused to exist in that circumstance. By doing that we would get a much broader picture of the overall problems that exist out there, and not just look at those where there was an actual collision hazard at that particular point in time.

For instance, at Detroit, where that accident took place, there were other aircraft which entered that runway unauthorized, but it was not reported under the FAA system because it was not required to be reported. There was no collision hazard at that particular point in time.

We will all learn more about the problem if we collect and review all of the information that can be brought to our attention.

We also notice, in looking at the NASA ASRS database, that we see a ratio of approximately 10 to 1—10 NASA reports for every 1 FAA runway incursion report, an indication of the level of the problem out there in the field.

With that introduction, I would now like to look just a little bit, if I may, at causes and solutions. In order for that to make sense I have to talk about responsibilities—the responsibilities of the controller on one hand, and of the pilot on the other. The two must work together as a well-integrated team in order to address the runway incursion problem.

The controller has a responsibility to assess and gather information. He has a responsibility to formulate a correct clearance, and then to deliver that clearance to an aircraft. The pilot, on the other hand, has a responsibility to receive the clearance, interpret it, navigate, and then correctly maneuver his aircraft. In order for this process to work the controller has to deliver a correct clearance; there has to be communication without misunderstanding; and there has to be the correct interpretation and navigation and maneuvering on the part of the pilot.

But before I go into detail with each one of those, let me talk just a little bit about low tech versus high tech. We tend to put an awful lot of emphasis today on high technology solutions. We propose that that is well and good. There are high technology things we can do, but there are low technology things that we should be doing today.

I can remember a professor back at the University of Southern California teaching safety subjects. He talked about hardware solutions to problems versus human factor solutions to problems. In order of increasing effectiveness in safety solutions, there is no question that we can issue a warning and say, "Hey, be careful out there." We can say we're going to do this procedurally different, or thirdly, we can say that we'll fix the hardware so that it can only be done some particular way. Obviously, the hardware solution is the one that's the most effective. We can't always do it, but I would simply point out that there are some low technology hardware solutions that we believe are available to us.

Now let's look for just a brief moment at the controller, his responsibilities and how he fulfills them.

I would point out that in looking at the runway incursion accidents that have taken place, our assessment is that each one of these took place in a period of very high workload for the controller, and they took place in low visibilities or at nighttime conditions when that workload was made even more demanding. The controller is placed in a position of having to juggle balls and keep a certain number of them in the air. When you add too many of them, he can't keep them all in the air at one time, and a failure occurs.

Therefore we believe redundancy is necessary to assist the controller. There are two ways to do that, basically. One is with man and the other is with machine. As far as man, we can provide coordinators in tower cabs, such as has been done at Chicago O'Hare and is feasible at other airports. What it requires, however, is funding and manpower to be able to do that.

We can also provide machines, artificial intelligence. These are high technology solutions which may come later on, such as ASDE-3 and AMASS. We certainly think they have potential, but let's not focus strictly on those aids because first we have to recognize that there are a very limited number of airports at which we are going to be able to place that equipment and be able to afford to place that equipment.

We look at high technology and we see what things have done in other parts of the world. At London Gatwick for the last 10 years they have been using a marine radar, mounted on another tower next to the regular tower cab. It has been operating quite successfully. It is certainly somewhat high tech, but it is off-the-shelf equipment that they've been able to use in order to provide equipment to their controllers.

We would also point out that AMASS, as we understand it in talking to some of the researchers, can warn a controller that a runway incursion has taken place, but it may not be able to give him information soon enough to prevent an accident. Therefore we must look for other solutions in order to prevent that aircraft from getting on the runway in the first place.

Let's now look for a moment at the communications process. Readbacks—we agree with the controllers that there has to be well-understood communication between the parties. We can use standard routings to help simplify that communications process. We can get rid of terms like "the 50-yard line" in Los Angeles, and for international pilots, standardize on terminology like "Taxiway Bravo" or "Alpha" or terms that are well and clearly understood.

We can implement solutions such as traffic control lights at entrances to runways, known in ICAO terms as stop bars. We have been studying them for years. We have been unable to implement them in the United States, as has been the case in Europe. The prime argument we seem to be faced with whenever we talk about this system is the effect upon airport capacity. But I have to ask, what comes first? Airport capacity or safety?

Looking now at the pilot, his interpretation of the clearance and navigation around the airport, certainly there are things we can do in our training programs as far as cockpit procedures. If you get into our new technology airplanes you will find there is a lot more "gee whiz" stuff in the cockpit, and what we seem to have done in the process of integrating these aircraft into the fleet is to add more heads-down duties during taxi for the pilots. We end up with one pilot taxiing the airplane, the other pilot heads-down loading the equipment. We need to look at how we operate with these aircraft and use the technology to help us and not to divert us from the prime concerns.

Airfield lighting—think about the concept which has been developed in the ICAO study groups that we've worked with of a red line around a runway, clearly defined by well-illuminated lighting, and add to that the signs to identify what those locations are. It's a concept that has been accepted by the working group and has been adopted in ICAO's edition of new standards for preventing runway incursions.

We believe that things such as taxiway center line lighting, in lieu of the blue sea of lights that we see out there, are an important solution to the problem, and yet we are unable to get the agency or other parties to agree to the use of center line lights because of their expense. Another look has to be taken at that problem to simplify the navigation task and make it more clear which is the proper way to go.

Visual conspicuity is not high technology. It is a low technology solution, and implementing standards have already been adopted by ICAO.

What progress have we made? We have been engaged over the last eight years in this area, working on standards development, primarily at the international level. We have also been working closely with the FAA through a series of meetings that began as far back as 1986. The question which remains, however, is will the United States adopt international standards, or will they go their own way?

The FAA team is working on a runway incursion program. We are very pleased to see that work, but we will have to step back, wait, and see what actual progress comes out of that.

What we need is implementation now of the low technology solutions to help the problem, help the controller, help the pilot, assist in the communications process, while we continue to develop and to do research work on high technology solutions.

Thank you very much, Mr. Chairman.

Mr. **Oberstar**. Thank you, Captain Haase, for some very helpful insights into the problem that we're dealing with here.

Mr. Poritzky.

Mr. **Poritzky**. Thank you, Mr. Chairman. I have a full statement which I hope not to repeat here, because many things——

Mr. **Oberstar**. You may summarize your statement. The entire document will appear in the committee record.

Mr. **Poritzky**. Thank you.

I am grateful for the opportunity to testify on behalf of the Airport Operators Council and the American Association of Airport Executives.

Our airport message can be stated simply. The reduction of the hazard of runway incursions involves many factors, as you've heard, ranging from human performance limitations, to the design of optimum markings, signs, and lighting. The issue will not yield to simple fixes, no matter how attractive some of them may seem, but must be attacked as a system problem which requires a system solution.

A sound, well-integrated approach to the development of a modern surface traffic management system is needed, using and standardizing the visual aids that we already have, as Dave Haase has said, and incorporating long-neglected new tools that modern technology offers.

Such an effort can benefit us in two ways, by providing the best possible protection against runway incursion accidents, while at the same time providing a full-time, efficient management system for the surface of busy airports. Solving one problem, we feel, will automatically solve the other. It is a mistake to attack the runway incursion problem in isolation.

It is clear—and it is gratifying to us—that FAA now plans to pursue this matter vigorously. It is essential that the long-standing and frequently-discussed FAA and Government acquisition and procurement problems not be permitted to hamper rapid development and implementation of the elements of the airport surface traffic management system, as FAA's system team must define them. Help will be needed from Congress and the Administration to give FAA the resources, and a rational way without roadblocks to undertake rapid research and development where needed and to achieve timely implementation of the necessary facilities and systems.

The Runway Incursion Plan which has been talked about a great deal here this morning represents a fine first step, a plan of organization, toward the solution of this longstanding problem. The importance of the plan is that it sets the stage for treating the many efforts on a system basis. This is the first and most important task that must get under way, and quickly. This effort—to be done, I hope, by a system design team that FAA will appoint and that I believe FAA is in the process of appointing—must sift the many separate efforts which have moved independently. Many such efforts are described in the Plan, but those efforts have moved very slowly, as has been said. The system group must discard the peripheral work, define the system, and then concentrate on the high payoff efforts with resources, dollars, and people.

Airport operators support the FAA initiative to deal more energetically with the problem, and we are prepared to help in any practical way.

It has been said by all of us, I think, that the problem must look to a variety of remedies. A number of them, as has been said, are not, in the first instance, technical, but are rather in the nature of education and training. Airports have been active for years in providing such training to users of the airport operating area, and in my testimony I have described some efforts, particularly at Indianapolis and Newark, as examples. Such efforts may need to be expanded, but they require actions in the cockpit as well. It may be necessary to assure that better airport layout charts are developed for cockpit use, along with pilot training for their use. New and modified procedures may need to be established to assure that pilots are thoroughly familiar with the airport layouts that they encounter. Only in that way can airport signage and markings be effective.

Technology must be a major element of the system solution, and there is no lack of it; quite the opposite. FAA has been doing R&D for more than a quarter of a century in this arena, and I think that's been pointed out. The problem has been that system solutions are expensive and complicated and not attractive until tragedies and loss of life dictate otherwise.

More than 25 years ago, the Laboratory for Electronics, a company long out of business, developed a primitive airport surface guidance system based in part on railway safety switching technology. It was designed to give controllers a clear picture of the airport surface and surface routes.

Twenty years ago, a magnetic induction loop system, called STRACS, which could give information on aircraft to controllers when they were not visible directly, was developed and tried at John F. Kennedy, but soon shelved because of the cost.

Fifteen years ago, FAA developed a radar beacon-based trilateration system which, in association with airport surface radar, could give controllers positive identification of all transponder-equipped vehicles. A prototype was built, tested at Boston Airport, showed promise, but was abandoned.

A dozen years ago the Transportation System Center conducted an elaborate technology and cost-benefit study of surface surveillance systems, selected the optimum technologies, and determined that the technology could be sensibly applied at seven or eight of the busiest airports. The technologies selected were about the same as those that are now being resurrected.

Not much happened. Lack of interest, higher priorities for other, more widely-applicable projects, FAA budget problems, the emergence of the expensive and high-visibility NAS Plan all helped to put surface surveillance systems and this work in general on a very dark shelf.

One major effort did get under way but got bogged down in the procurement morass. Actually, the FAA decided in 1975 to develop a modern version of the surface surveillance radar. That is what has now become ASDE-3. The development actually began with a contract let through the DOT TSC, to the Cardion Corporation. Incidentally, I believe this is the firm that has supplied the radars to Canada. In 1977, with test and evaluation scheduled to be completed by summer of 1979. Problems developed, which I describe at some length in the testimony, and yet as we all know, as yet not one ASDE-3 has been commissioned.

Even though this system has been developed, and modern systems are in use at a number of airports outside the United States, notably in Europe, the FAA procurement/acquisition system failed to bring the equipment to beneficial use in a reasonable time. The fact is that the Government procurement/acquisition system has not worked well in a number of the systems that the FAA is trying to buy in the NAS Plan, causing delays, additional cost, and not necessarily first-class products. We must not let this happen to FAA's efforts in this arena.

You said that we are probably relying too heavily on perfect human performance in running the ATC system. We believe that the essential ingredient, in addition to all of the systems we've talked about, is the development of aids to controllers which will help them better comprehend the dynamic traffic situation and offer advice on specific actions to consider in resolving problems. Such expert system help, rapidly growing in importance in airline cockpits and in military systems, has not been pursued actively by FAA as yet. This may be so in part because the controller community has been suspicious of such systems and fears that such automation, misapplied, could rob controllers of authority without relieving them of responsibility. Such fears are probably groundless in 1991. The successful expert systems that are in use have shown that they can offer advice and valuable assistance, but not take over.

I noted above that providing the highest level of safety and operational efficiency are goals which are achievable with the same remedies. They require looking at the airport surface as a system, and up to now that has not been done successfully. We are in strong support of FAA's initiative to do just that.

AOCI and AAAE believe that the ingredients are in place for early progress. We believe, as has already been said, it would be appropriate for FAA to move rapidly to complete and implement the efforts on signage, visual aids, ASDE radar and its enhancements, long underway. But at the same time we believe FAA should prepare—and we think it could within the next 60 days—an action plan which shows an integrated airport surface traffic management and incursion control system, with the roles of the various elements—lighting systems, signage, surveillance, control and communications technologies, needed R&D, needed automation help using logic expert systems, et cetera—clearly defined. The action plan should show milestones and estimated time for completion of the various elements. The action plan should also show candidly the funding requirements to carry the work to completion vis-a-vis currently planned funding and current funding projections.

The plan should also identify—and I know how tough this is—problems in the procurement process which are likely to create unwarranted delays.

Thank you very much, Mr. Chairman.

Mr. **Oberstar**. Well, thank you, Mr. Poritzky, for your testimony to which you have obviously given a great deal of thought, as is your custom.

Let's start with the last point first. What would it take to convert the Gray Book to an action plan, in your judgment?

Mr. **Poritzky**. Mr. Chairman, I think FAA is well on the road. If what I have been told is correct, and I think it is, FAA is planning to put together a system team, and will, in very short order, look at the various pieces. If you've read the Plan, you will see that there are a number of projects listed with no particular priorities, no particular interconnection.

The most crucial part of the job, as I see it—and this is not to denigrate signage or ASDE or AMASS or any of those things—the most crucial job is for a group of very knowledgeable people to sit down and say, "How do we solve this problem totally? How do we create a surface traffic management system, and what are the ingredients?"

As I mentioned in the close of my testimony, I think it can be done rather quickly because a great deal of background work exists. I think that's the first step.

Mr. **Oberstar**. You have a level of confidence that many of the elements in the Runway Incursion Plan can be brought together in a 60-day action plan, implemented and put into effect without some of the rather longer time frames that seem to be envisioned in that plan?

Mr. **Poritzky**. I think that the plan can be developed in 60 days. I think there will be some research and development required. Let me cite an example:

A surface traffic management system will require better surface surveillance than we have yet seen. I mentioned in my testimony and others have mentioned it today that the ASDE, in combination with the trilateration beacon system, has been talked about for 12 years. It has been demonstrated. It can be used; whether it is the right thing in 1991 is open to question. There may be newer technologies available, and available in a relatively short time.

The system design team has to look—first by itself, and then with the industry—at what is rational now, and then to move toward that development. There is R&D, no doubt about it, but in my view there are a number of things that can be done very quickly such as the completion of signage standardization, lighting, pilot training in the use of charts, agreements on where the signs ought to go. A number of things can be done quickly.

Mr. **Oberstar**. Why couldn't that part of the plan, at least the signage and the lighting part, the standardization, be done as a top priority?

Mr. **Poritzky**. It should be, sir.

Mr. **Oberstar**. I mean yesterday.

Mr. **Poritzky**. I think it can be, but there's a risk even there. Dave Haase talked about the stop bars, the line of red lights around the airport. Those lights need to be part of the total system. There are a lot of arguments in FAA and outside on the best way to use the stop bars, what kind of controller involvement there should be. Can we set up the controllers to make new kinds of mistakes?

There is a difference in the philosophy toward these things, as I think Dave will agree, between the use of stop bars in Europe and stop bars in the United States. We do know that one element in FAA believes that the stop bars are best used as part of an automated system so that there is not very much human involvement in their use. I think that has to be wrung out before you can say, "Yes, let's put in stop bars and develop procedures for them." That's why we need that 60-day intensive look at all of the issues.

Mr. **Oberstar**. Well, I have a feeling that much of that plan can be put in gear and put in motion—as it is indeed FAA's intent to do—much sooner than they are planning to do.

Captain Haase, your suggestion of a tower coordinator, how would that person function in the tower? What would that person's role be?

Captain **Haase**. Mr. Chairman, we're not the experts on air traffic control. Maybe Mr. Bell could better answer that question for you. But based on what we know about what has been done at Chicago's O'Hare, this individual functions as an overseer, if you will, a second set of eyes for the operating controller, as compared to a supervisor who would otherwise be on duty. He is part of the team to provide the redundancy, to assist the controller where the controller may not be aware of conflicts in order to provide, if you will, expert assistance to him. But again, I would defer to Mr. Bell in that regard.

Mr. **Oberstar**. Are you troubled by, or are pilots troubled by, any appearance of confusion in the cab? Or lack of coordination?

Captain **Haase**. Well, we have to approach that from what incidents have taken place in the field.

Mr. **Oberstar**. Not from what you sense in the communications, but from the results in the real world. Is that what you're saying?

Captain **Haase**. It does happen from time to time. There are cases where there is misunderstanding, where there are incorrect clearances issued. It's just one of those things where an individual gets overloaded or can't handle all the information being supplied to him. So yes, confusion does take place from time to time.

Mr. **Oberstar**. And the cockpit does hear that or sense it?

Captain **Haase**. Well, sometimes we do, when we can unscramble it. Other times, we may not be aware of it. At Chicago, again, there were clearances for aircraft on two separate runways being cleared for takeoff at the same time, intersecting runways. The cockpit didn't pick that up until it was very late in the takeoff roll. There was an avoidance maneuver which avoided a disaster, but sometimes we're just not able to pick that up.

Mr. **Oberstar**. Thank you.

Mr. Bell, what is your reaction to the suggestion of a tower coordinator? How would that person function? And in your judgment, would that help matters?

Mr. **Bell**. Yes, sir. I think Captain Haase stated it very well, what that role would be. Quite literally, we contend that we need to have those extra eyes, especially during peak traffic periods, but in other periods also.

One of the major problems that I think we have to look at, and this is not a high tech problem, is that controllers don't get to use the best tool that they have got—one that FAA did not create nor did man create—and that's their eyes, looking out the tower window. Controllers are sitting there looking at a BRITE radar screen, looking at an ASDE radar screen, looking at flight progress strips, looking at CRTs, looking at windshear alerts, looking at a myriad of technologies, but they're not looking out the tower window.

If they are going to be tasked with using all these redundancies—and we support the use of that equipment, and we need those redundancies—then we're going to have to have somebody looking out those tower windows, because the principle of those kinds of operations is "see and be seen." The controller needs to be able to scan those runways all of the time. I know from experience in the towers that at times we don't get a chance to look out those windows enough, and if we can't look out, somebody else had better be looking out.

Mr. **Oberstar**. Are there towers that your association has identified as understaffed, for which a staffing standard may have been established but for which the standard is insufficient? Or even in comparison to the standard, they are understaffed?

Mr. **Bell**. Yes, sir, and the FAA has also identified them also with their pay demonstration project. Those are towers and radar facilities, but predominantly radar facilities. Furthermore, in our opinion the FAA's staffing standards are somewhat arbitrary. They are not conducive to the complexities and the problems that we're going to have in a system that is driven by weather, human factors and the whole nine yards.

But there are a lot of facilities that are still understaffed. The premiere facilities that are encompassed in the program remain that way in spite of a monetary compensation attraction. It's not working for them and they remain understaffed.

Mr. Oberstar. Thank you.

Mr. Clinger.

Mr. Clinger. Thank you, Mr. Chairman.

Gentlemen, I want to thank you all for the very helpful testimony we've had this afternoon.

Just following up on the chairman's last line of questioning, it has occurred to me that we're talking about adding a lot of new bells and whistles, high tech procedures, to address this problem. I think you pointed out one of the concerns that I have, and that is that if you are going to be using all these things effectively, your eyes are not going to be perhaps where they ought to be.

But let's take it a step further. It's been suggested that perhaps we ought to automate this; in other words, having it totally not rely on human factors to function. Is that realistic, do you think? Could we ever get to a totally automated control of this situation?

Mr. Bell. I don't believe that's possible in the foreseeable future, sir, until we can develop a computer or software program that duplicate or replicate the cognitive thinking of the human brain. People are the mainstay of the system today, both in the cockpit and on the ground. While there is obviously advanced technology that can help that program along, I think that people are going to be the mainstay in the future, also.

Perhaps our position will change somewhat, in that we might be managing a little bit more than we are controlling, but I don't want to delve into that too much because I don't want to talk about doing away with our occupation. Quite frankly, today's system is being driven and facilitated by the equipment that was designed for the 1970s, not for the 1990s. It's not so much that we have a problem with the advent of new technology. Our problem from the control perspective is, what are we going to do until we get that technology? If we say hypothetically that the god of technology is going to come down and bless us so well, that we're going to fix all these problems in the infrastructure of the ATC system, what are we going to do in the 10 years until we get there? That's the controllers' concern now. Our concern is that the reliance for all these problems is put on the backs of the people without the redundancies and with the infrastructure in somewhat of a shambles in many places.

Mr. Clinger. Captain Haase, I think you too suggested that because of the movement toward high tech and looking at more scopes and so forth, that again there was a tendency too much for people to be heads down in the cockpit. Isn't that a concern the more that we move toward automatic systems here, that we're going to require the pilots to be looking down rather than out?

Captain Haase. Yes, sir. We fully agree with you. We think we need to step back and look at the basics, and this is where crew training and evaluation of the duties which are required of crew members during taxiing to and from runways need to be carefully evaluated. As we've added new pieces and new technology in the cockpit, we've added new duties to go along with that. In some cases those have proved to be distractions; while they are helpful in other ways, they take away from some of the prime responsibilities.

I can recall coming across a photograph in a 1948 issue of National Geographic at LaGuardia Airport. It had a crossbuck sign like you might find at a railroad crossing. In this case it was a road that crossed a runway, and it said, "Stop, Look, and Listen". Maybe we need to reemphasize some of that and get away from the high tech to some extent and get back to the basics.

Mr. CLINGER. Well, let me play devil's advocate a little bit here. I notice in the Gray Book that the study shows that there is a much higher incidence of runway incursions in VFR conditions rather than where visibility is obscured or more difficult. Does that suggest, perhaps, that in those cases they are looking at the instruments more, and the instruments are effective in preventing those sorts of things, whereas when we have VFR, perhaps the controller and/or the pilot are using their eyes too much?

Captain HAASE. Well, I think there are a couple of possible things.

Number one, you have lower traffic volumes in periods of lower visibility, so I think that just by virtue of that division you're going to see different numbers in good visibility as compared to adverse visibility conditions.

And going beyond that and taking that concept into mind, traffic volumes at the airports in good visibility conditions are much higher. The frequency congestion is much higher. The number of airplanes that we are moving—because there are so many more airplanes out there, this tends to lead to the probability that it's more likely in visual conditions.

Mr. CLINGER. On another subject, we talk more and more about the globalization of aviation and the fact that we're now becoming a world-wide industry. I think you indicated, Captain Haase and others, that some of what is being done in foreign settings is something that perhaps we should be considering and are not.

How do you compare what's going on in some of the foreign settings to where we are? Are they ahead of us in terms of addressing this issue? Are there things that we should be trying to incorporate? Shouldn't we be trying, basically, to move toward an international system for runway control?

Captain HAASE. Yes, sir. Back in 1982, I believe it was, ICAO started revising their manual on surface movement guidance and control systems, actually updating that and upgrading it from a circular to a manual. I believe that manual was published in 1986, which is the year that the FAA began its efforts. So the international community had basically agreed on the concepts and precepts long before the United States had become involved.

Even more recently, ICAO has now significantly updated its standards in Annex 14 regarding airport lighting and marking. The one issue on which they have not yet finished work happens to deal with taxi guidance signs, and that work is well under way.

But if you look at the international community work and also look at implementation, I think you will see more implementation of some of these newer countries than we do see in the United States. The opportunity, though, is there for us, to grab hold of this moment and to begin to apply those standards in a uniform fashion.

Mr. **Clinger**. But at the moment, I think you indicated, we really haven't made that determination, whether we're going to try to integrate with the European or foreign systems or go our own way?

Captain **Haase**. That's correct.

Mr. **Clinger**. Okay.

Thank you, Mr. Chairman.

Mr. **Oberstar**. Thank you.

Mr. Geren.

Mr. **Geren**. Thank you, Mr. Chairman. I have a quick question for Mr. Bell.

In comparing the professional life of a traffic controller in the United States to the European controller—or other parts of the world, not just Europe—could you compare the responsibilities that you have here to what they are asked to shoulder in other parts of the world?

Mr. **Bell**. Yes, sir. I recently came back from a meeting of the International Federation of Air Traffic Control Associations, which is a conglomerate of the different controller associations around the world. Their problems are much the same as ours. However, if you took the amount of traffic that is worked in Europe and Canada in any one given month, you would probably find out that U.S. controllers work that kind of traffic on a given day. In my opinion there is no way you can compare the workload—of course, I am obviously biased—of what U.S. controllers do with that of our European and Canadian counterparts. Now, obviously they have less controllers in their workforce and they have different kinds of terrain, different kinds of technologies, things like that, but fundamentally I think our workload is much more serious than in many cases overseas.

Furthermore, we find that the working conditions of controllers in Europe and Canada are more favorable than the working conditions for controllers in the United States. They have greater benefits of annual leave, sick leave, a shorter work week, and they are not required to work as many airplanes as is the average United States air traffic controller.

So I don't want to make it sound like our brothers and sisters in the rest of the world are not earning their paychecks. I believe that they are, but I have to tell you that in this country these controllers do an awful lot more than I think our counterparts do in many cases.

Mr. **Geren**. Are the responsibilities in the tower broken down along the same lines over here as in Europe or Canada?

Mr. **Bell**. I think fundamentally it's very much the same procedurally and responsibility-wise. Obviously, other countries have different kinds of technologies. For example, somebody mentioned interface. The Canadian government just selected the Hughes Company to put together their technology in their new automated air system, which I find somewhat ironic, because the United States selected IBM as their contractor. So when we talk about interfacing a global society, even across the U.S.-Canadian border, I think we're going to have some problems when they are on the Hughes system and we're on the IBM system.

But fundamentally, air traffic control is pretty much universal. It's below 10,000 feet, three miles longitudinally and 1,000 feet vertically. That pretty much holds true.

Mr. **Geren**. All right. Thank you.

I have no further questions. I appreciate the panel's testimony. Thank you for your hard work.

Mr. **Clinger**. Going back to Mr. Fleming, talking about the automation of the ASDE, in your testimony you state that ASDE-3 should be fully automated to reduce the consequence of human error. But given the current level of development of ASDE-3 equipment, in what time frame do you think such automation might be available for airports? Wouldn't it be better to go ahead and develop the surface radar to be operated by a human? Shouldn't we set some priority in what we ought to be doing, and wouldn't it be better to maybe move on the radar first?

Mr. **Fleming**. Mr. Clinger, I would agree with you. I think, however, that Mr. Del Balzo's statement indicated that they are going to attempt to do this on parallel tracks and develop the automation model and service test it in the field, I believe, first at San Francisco. I believe their objective is to try to get the first test article in the field before this year is over.

If there are problems with that automation module, I certainly don't think we should delay the availability of the ASDE-3 radar. We want the air traffic controllers to have the best tools available, even if they're not the perfect tools.

Mr. **Clinger**. Thank you.

Mr. **Oberstar**. Let me engage both Mr. Bell and Captain Haase on readback. I just wonder whether readback is sufficient, whether the procedure is in fact sufficient.

What responsibility does the controller have to assure that the pilot has done what he said he would do? And from a pilot's standpoint, is the instruction from the controller adequate? Is it delivered too quickly sometimes? Do they start before the microphone is on and cut the microphone off before they've finished giving the instructions?

Mr. **Bell**. Well, there are going to be those kinds of problems in a system. I mean, there are equipment breakdowns causing those communications problems. There is a breakdown because of the fact that a controller doesn't have just in his or her ear the voice of the pilots talking to them; they also have the voices of other air traffic controllers they're talking to from all over the facility. So the best way to describe that is that things do get missed. When you get into a really busy environment controllers are going to miss readbacks occasionally. And while it's a good idea to be able to get a readback all the time, it's just not practical in the real world environment. Controllers do talk fast, and that could vary from geographical place to geographical place. Having worked in New York, I found that the controllers there would talk really fast when it's really busy. I was listening to the videotape this morning, although I couldn't see it, about the re-creation of a real environment in a control tower. I will tell you, I have never heard a pilot or a controller talk that slowly in my entire life.

Mr. **Oberstar**. That's what I said. Even I could understand them.

Mr. **Bell**. The real world is that sometimes you have to fight like crazy to get a word in edgewise. That's a capacity issue. That's what drives, that inability for a controller to get a word in edgewise. I've been on the receiving end at times when I needed to talk to a pilot and I just couldn't. Unfortunately, some of those occasions result in a problem for us, because if you're going to talk to a pilot who is getting close in an airplane and you can't get a word in edgewise, you're going to have a safety problem. And that's the kind of system we have in a lot of places where it's so congested and so packed full of people trying to get in and talk, that a lot of things do get missed in that bedlam.

Mr. **Oberstar**. Captain Haase.

Captain **Haase**. Yes, Mr. Chairman. I would echo Mr. Bell's comments.

There were some comments made here earlier this morning that in one of our major airports there's not even room to get your call sign in simply to roger the clearance, much less to read back significant parts of it.

I would point to the hazards of that, citing one runway incursion incident recently that happened on my own airline where the pilot simply read back his call sign, thinking he understood what the controller meant, but he did not really understand what the controller meant. There was a difference in perception.

If I can relate a little bit to the British approach to this, in their studies going back to the early 1960s looking at Heathrow Airport, they determined that frequency congestion was definitely going to become a problem as there were more jet transports coming into the airport. The solution the British came up with was selectively switchable lighting systems on the airport. The technology they used to develop that is very manpower-intensive and probably not the way we would go from a technology standpoint today. But programs such as automated surface traffic control have some real promise in automatically switching those lights and directing the aircraft around the airport, as opposed to all of those communications having to be issued verbally.

Also, in regard to clearances, what takes place in good weather versus bad, if I could go back to Mr. Clinger's question about runway incursions taking place in good visibility, that's true. There are more in good visibility. But if we look at the actual collisions that have taken place, they have taken place at nighttime and in poor visibility conditions.

So sometimes at the last moment the pilot is able to avoid the other aircraft or the controller is able to see the conflict developing by looking out the window and averting tragedy, and in lower visibility conditions, that backup—that redundancy—that the controller supplies is not always available.

Mr. **Oberstar**. Well, what responsibility do each have, the controller and the pilot, on the matter of readback? The controller to make sure that the pilot, having read back, has actually done what he was instructed to do, and the pilot really doing what he thinks he heard?

Captain **Haase**. Well, what readback really does for us is simply to assure that the clearance was correctly received. It does not mean that the clearance was correctly understood or interpreted, or that the navigation will take place in accordance with that clearance.

Mr. OBERSTAR. Exactly. That's why I asked the question. The controller hears the readback, thinks the pilot understood, because "he told me that he did," then can you go about your business and not follow that aircraft?

Mr. BELL. No. It is our responsibility to continually monitor that aircraft, and that's where the area of distraction is going to come in. A controller relays an instruction to an aircraft and he expects—he doesn't assume—that it's going to be followed to a certain degree of practicality. Then again, we have a system that has prescribed routes on it, so it's not unusual for a controller to have that expectation. So it would probably be a rare instance where an expectation that a controller had for a pilot wasn't delivered on, and it's probably because something was going on in the cockpit that the controllers were not aware of.

There are so many factors that are involved. On the controller readback issue, we finally have been able to work with the FAA to get a human factors look at this issue. We've had two decades to study these kinds of issues because these are not new problems. These are problems that date back to the 1960s and the 1970s. But finally, we got the FAA to agree to study the human factors issue with controllers and their technology and with the pilot in an environment that is not punitive. That's been one of the issues that we've had for a long time; that when a controller makes a mistake and misses a hearback and there is a loss of separation, the controller is going to bear the full responsibility and that's going to result in a punitive action. We need to be able to examine why these things happen, why we miss those calls, and why we have expectations that are not fulfilled.

And finally—this is very recent—we got the FAA to agree to a study without the punitive action being so forthcoming. It's now going to be productive for us to study.

Mr. OBERSTAR. In that respect—of course, human factors are a matter that this committee has pushed and this chairman has pushed for many years, and we're finally getting the recognition that the issue deserves—but in that respect also, is the greater use of simulators going to be of benefit to the controllers?

Mr. BELL. I think so, sir. As an educational tool, I think it will. But I think from a real-time experience perspective I don't think you're ever going to be able to replace that on-the-job training that you're going to get with real airplanes and real human beings in those airplanes. You just can't recreate that well enough on a computer to be able to give you that level of intensity to learn from. Experience is the primary tool to teach a controller.

Mr. OBERSTAR. No question about that.

As to the matter of redundancy, on board aircraft we have great redundancy in systems to ensure fallback and fail safe, and so it must be in the Air Traffic Control System. That's why I think that at selected towers, TRACONs and centers, we need more people for those times when weather deteriorates, traffic increases, problems develop and you need more personnel to spread that workload out. You cannot develop a system in air traffic control which operates on a prime time, prime weather, prime operating conditions basis.

It really needs to function on the assumption that we are going to have a conjunction of all of the worst elements and be staffed appropriately for it, as well as have the appropriate technology.

That leads me to the next point, of the ASDE being installed at only 29 airports. That's the goal of the FAA. I would like the panel's response: is that sufficient? Captain Haase said it ought to be at all of our busy locations. I would certainly agree with that, but is that sufficient? And what is going to be the cost involved in a broader installation of ASDE than the 29 envisioned by FAA?

Mr. Fleming.

Mr. **Fleming**. Thank you, Mr. Chairman.

I think that clearly we can't stop at 29 or 30. But this gets to the automation philosophy and the human factors issues and the means of providing redundancy and backup capability. If the decision is that the controller will continue to work in visual meteorological conditions much like he or she does today, and we should have a full-time surveillance tool with a set of algorithms which will provide a warning or an alert of a pending collision on the ground, then it seems to me we would want to have that kind of capability at a large number of airports. I don't know specifically how many, but it clearly should be larger than 30.

Given that, we will have to take a close look at the cost of such a system. ASDE-3, as has been noted here today, is a very expensive system. FAA is considering development of a lower cost surveillance tool device or system which would make it more beneficial at a larger number of airports. I think that's the kind of a systems question that Mr. Poritzky was talking about in his earlier remarks, and perhaps he would wish to elaborate.

Mr. **Oberstar**. Mr. Poritzky, a good entry for you.

Mr. **Poritzky**. Yes. Thank you, Mr. Chairman.

I also believe that better surveillance of the airport surface is desireable at many more airports than 29 or 30, but I think the system study is crucial because ASDE is a primary radar with no identification on it. AMASS, the automation module that Mr. Fleming was talking about, still doesn't give you an identification of the aircraft. The current displays of ASDE also leave a great deal to be desired in controller human factors terms.

I think that ASDE or the primary radar is likely to continue to play a part in a sensible airport surface traffic management system, but it alone is probably not the best way to go. I think, as I tried to say in my testimony, we've got to look at the whole picture—better guidance and better information display for the controller—to overcome some of the problems that Steve Bell was talking about. It's essential. It's not hard to do; we do it every day in all kinds of different technologies.

No one here in this panel so far has mentioned Datalink. Datalink has been around since 1948. We are not yet using it in the Air Traffic Control System for any other use than the one that Mr. Del Balzo described earlier, for clearance delivery, using not an FAA system, but the ACARS. There are ways to improve the situation a great deal. In the military, expert systems have been in use for some time. It has been called a "pilot's assistant" for single-engine fighter aircraft. It is an "expert system helper," in effect sitting next to the pilot, which offers advice. It doesn't take over, but it offers advice to give him the picture.

This kind of automation aid is available to us. They will take development, but will make the major difference. So, as important as ASDE is, or ASDE with AMASS, it's not the end of the problem by any means.

Thank you.

Captain **Haase**. With respect to your question regarding the number of surface radar systems needed, we feel that the priorities need to be established. First they go into those airports that are authorized to conduct very low visibility operations, and we believe that it should be a standard for those operations. We don't think those operations ought to be approved until that radar is in place.

We have two candidate airports right now for so-called Category 3B operations, that is, visibility below 600 feet. The question with respect for the requirement for surface radar to be operating during those conditions has not yet been resolved. We think they need to deal with that.

Now, as we go further, certainly it is most desirable for those conditions where the controller cannot visually scan the whole airfield, for the radar to be able to supplement his visual picture, if you will. We think that's a basic element of the system and very highly desirable.

Mr. **Bell**. I would agree with Captain Haase's statement, Mr. Chairman. I would also like to express concern with respect to the number that the FAA has announced. If I were a betting man, I would bet they are probably going to be strategically placed in areas that have a lot to do with capacity, and I think that would be the inappropriate way for us to deal with the ASDE installation in any place. It should be the safety concern first. Where they are needed, as Captain Haase pointed out, is where you have a problem with the visibility and the controller's ability to look out on the runway, and not just another tool to help drive the capacity in the system at a few certain select airports. We're going to have to look at every tower to see where it's going to be needed.

[Mr. Bell's prepared statement appears on p. 79.]

[Captain Haase's prepared statement appears on p. 119.]

[Mr. Poritzky's prepared statement appears on p. 140.]

Mr. **Oberstar**. Thank you very much. That is good observation. While it may be costly—I think these installations run in the range of $4 million—I think it was the Lufthansa check pilot speaking at a safety conference that I participated in that said, "If you think safety is expensive, try an accident." It's worth every dollar that we invest.

So has been your testimony, worth every minute and much more of the time that we've devoted, and I appreciate the contribution that each of you has made and the time and effort that you have invested in preparing that testimony.

I would close on this note. I will ask the Administrator of FAA to provide the subcommittee a quarterly progress report on the implementation of the Runway Incursion Plan. I note that Mr. Harrison, the program manager, is still here. We will ask him to be sure to convey that directly, as we will formally, to the Administrator, as a means of giving the subcommittee and the public a yardstick by which to measure progress and for us to be kept regularly informed of developments. I think from time to time we will have informal sessions with the FAA to review the progress of this very promising plan, but not necessarily to have full-scale public hearings, although that may be important at some benchmark point.

I want to thank all those who contributed to today's hearing and to the very seriousness of purpose with which this matter of runway incursion is being taken by the FAA and by the National Transportation Safety Board, by the pilots, the controllers, airport operators and executives, all those who are responsible for the safe and efficient management of our aviation system, with the emphasis on "safe."

Thank you very much. The subcommittee stands adjourned.

[Whereupon, at 2:20 p.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

PREPARED STATEMENTS OF WITNESSES

STATEMENT OF R. STEVE BELL,
PRESIDENT,
NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION, AFL-CIO,
BEFORE THE HOUSE PUBLIC WORKS & TRANSPORTATION
SUBCOMMITTEE ON AVIATION
ON RUNWAY INCURSIONS,
WASHINGTON, DC
FEBRUARY 28, 1991

The National Air Traffic Controllers Association (NATCA) welcomes this opportunity to testify before the subcommittee on the timely and critical issue of runway incursions. As the chairman is aware, NATCA is party to the National Transportation Safety Board (NTSB) investigation of the recent accident at LAX, and as such, we cannot discuss specifics of that accident, nor speculate on its causes. However, we hope to bring to light some nationwide problems that lead to runway incursions and some possible solutions to them.

Last December's accident at Detroit and this month's accident at Los Angeles crystallized the nations' attention on runway incursions. However, runway incursions are nothing new. It is often quoted that the single largest accident in aviation history, the 1977 collision of two 747s at Tenerife in the Canary Islands, was due to a runway incursion. The NTSB has chronicled numerous near-misses on the ground that could have proven equally devastating and has made a series of detailed recommendations to the FAA, which for the most part the Agency has accepted. Why then does the problem persist?

First, I believe the FAA has tunnel vision when it comes to aircraft collisions. During the 1980s, getting more aircraft back in the sky was the number one concern, but there was also an alarming number of operational errors and near midair collisions. Two aircraft colliding in midair, as happened over Cerritos CA in 1986, became air traffic control's worst nightmare. The Government and the industry responded with expedited initiatives, such as the Traffic Alert/Collision Avoidance System (TCAS). In addition, the FAA had already committed billions or dollars for NAS Plan modernization of terminal and en route center radar equipment.

Unfortunately, there was never the same attention nor funding given to runway incursions and the potential for runway collisions. To this day, ground and local control are the neglected stepchildren that get a few table scraps. But as we have discovered, these sins of omission are coming back to haunt us. The exposure to danger and potential for catastrophe from a runway incursion are just as high as from a near midair collision. If that is case, why is the new airport surface radar slated to go into only 28 of the nation's 560 airports serving scheduled carriers? What sort of commitment to safety is that?

The issue is really one of capacity. The FAA is under enormous pressure to boost capacity. Capacity, rather than safety, often appears to be the engine that drives the Agency. Witness the NAS Plan which is heavily weighted toward capacity enhancement technology, such as the Precision Runway Monitor System. The FAA is trying to milk the airspace for every possible new operation while giving short shrift to the overall problem of managing a safe and efficient flow of ground and local air traffic.

The Agency predicts that by the year 2000, we will witness an increase of 16 million operations at towered airports. However, the irony is that as the Agency succeeds in enhancing airborne capacity, without an accompanying commitment to ground and local control safety, the potential for runway incursions increases. In other words, "What are we sacrificing in safety for increased capacity?"

The problem is further complicated by the limited amount of runway space and the surges in arrival and departure times caused by the hub and spoke system. Many of our airports, especially the older, urban ones, do not have the room. Simply put, we are trying to put too much aluminum on too little concrete in too short a period of time.

Today's ground and local scenario contains all the elements for a disaster: (1) a mix of all types of aircraft and ground vehicles;

(2) active aircraft moving in extremely close proximity to stationary aircraft; (3) aircraft that are trying to arrive or leave at the same time because of the hub and spoke system; (4) tortuous and often confusing taxiways and signs from the gate to the runway and vice versa; (5) congested frequencies; (6) surface detection equipment that is unreliable and prone to breakdowns; and most of all, (7) not enough full performance level (FPL) controllers to bring order to this bedlam.

NATCA contends that staffing is the root of the runway incursion problem and boosting staffing is the fastest and easiest way to address the problem. Contrary to FAA statements, the air traffic control system is not rebuilt to pre-strike levels. The FAA is back to cooking its staffing numbers. We are still short approximately 3,000 FPL controllers. In its 17,000 "controller work force figure," the FAA counts in supervisors who spend over ten percent of their time working air traffic. In reality, we only have between 14,500 and 15,000 full-time controllers, and out of that number, only 10,000 are FPL controllers as compared to 13,200 before the strike.

What we need today are extra eyes in the tower cab in the form of assistant local controllers and supervisors who are managing an operation rather than working traffic or training. There is no replacement for the skill and vigilance that an FPL controller can provide.

The dearth of FPL controller and its potential effect on runway incursions is most felt at the busier air traffic control facilities. Some of them, such as LaGuardia, have the positions of an arrival assistant or assistant local controller. The problem is that the position is not staffed. LaGuardia is allocated 33 FPLs; it has 12, and some of them have less than two years experience.

A developmental controller at LaGuardia will check out on ground control and then stay working that position for six hours a day for an indefinite period of time. That controller will not get the opportunity to train on the local control position, thereby depriving the individual from getting the larger picture of the operation. This is not to say that the developmental controller is doing a bad job. But the operation is much more flexible and runs much smoother with an FPL controller.

Where do we get controllers to fill these openings? In his FY 1992 budget, President Bush asked for an additional 300 controllers. It will not help very much. Between August and December last year, the FAA lost 411 FPL controllers to the termination of the lump sum retirement option. Given the Administration's hiring schedule, we will barely keep our heads above water.

Unfortunately, the FAA is also encountering severe problems with

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its training program. Last April, the failure rate at the FAA Academy at Oklahoma City reached 65 percent. Both NATCA and the Agency contend that this is due in part to the so-called controller seminar classes which they believe are allowing otherwise unqualified candidates to pass the controller aptitude test. Contract training has also been a wash, and the program at Chicago O'Hare was severely criticized by the GAO and the DoT Inspector General. In this regard, we desperately need more overtime money to provide for on-the-job training. Time consuming as it may be, OJT is still the best and surest way to turn out FPL controllers.

In the interim, the Administration has steadfastly refused to entertain the fastest and easiest way to ease the FPL crunch: allow controllers fired in the 1981 strike to reapply for new positions with the FAA. Given that technology has not changed much in 10 years, we believe that these controllers could regain their FPL status in approximately six months to a year versus the two to four years a developmental controller would take. We also contend that approximately 2,000-3,000 fired controllers would be interested in these new positions.

At our 1990 convention, NATCA voted overwhelmingly in favor of a resolution urging President Bush to reconsider his ban on the rehire of these controllers. Unfortunately, our plea fell on deaf ears and there is no indication that the President will change his mind.

NATCA has one other suggestion on the staffing front. We strongly advocate that the FAA set up a dedicated account for Permanent Change of Station (PCS) moves. Because of the lack of PCS money, the FAA cannot move those controllers it already has to where they are needed most. There are FPL controllers who have "bid" into some of the hard-to-staff Pay Demonstration Project facilities, such as LAX, and Bay and Coast TRACON, only to be told that they would have to wait two years before PCS money would become available to move them. How can the FAA run a safe and efficient system when the Agency cannot get the skilled people to the biggest trouble spots? The result is that a hard-to-staff facility must look only at its immediate environs or the FAA Academy for staffing, even if that means taking a less qualified candidate.

Equipment is the next major factor. Over the past ten years, we have seen FAA air traffic control elixirs fail miserably. The ARTS 3.03 software buckles under heavy traffic, causing data block switches and loss. The ASR-9 radar is showing major problems; its diodes are burning out so quickly that there are no more replacements left in the depot at Oklahoma City, and some facilities such as Bay TRACON are having to rely on their old ASR-7 and -8 radar systems. So please excuse us if we are a bit wary about FAA technological promises. Their Aladdin's lamp lost its magic years ago.

Airport Surface Detection Equipment, also know as ASDE, has been widely discussed in light of Detroit and LAX. The next generation of ASDE -- ASDE 3 -- is now being touted as a cure-all to runway incursions. NATCA is very worried about this perception because we believe that present ASDE capabilities are being oversold.

Let's begin with ASDE-2 which is in operation at 12 sites. We have had various reports about the effectiveness of ASDE 2. When it is operating according to specifications, it is a poor to fair piece of equipment. Sometimes it splits one large target into two, and during bad weather, when it is most needed, ASDE-2 is unreliable. Controllers lose approximately 25-35 percent of the display when it rains. A December 24, 1990 FAA memo from the Air Traffic Manager of the Atlanta ATC Tower to the tower's area managers states in part, "In all cases, remember the ASDE presentation drifts, thus needs constant evaluation....I recommend a conservative approach be taken when directing use -- including not using ASDE at all if conditions so dictate."

ASDE is also prone to breakdowns but the systems specialists do their very best to keep the equipment up and running. However, that work force has been cut to pieces and there are no longer pure radar technicians to service the ASDE; they must do many different jobs. The days of preventative maintenance are also long gone.

However, there is a fundamental problem with ASDE in general, and it is not a technological one. A controller at one of the ASDE-2 facilities said that for ASDE to really work, he would have to be glued to the equipment all of the time, but he cannot because of the variety of other operations he must juggle. For example, if a local controller does not give an aircraft a clearance to cross an active runway, it is unlikely that he is going to constantly double check that runway on the ASDE. However, a vehicle or an aircraft could scoot across the runway before he could realize what happened. Another controller told me that he does not like the false sense of security that ASDE gives. He believes that when operational conditions become poor, it is best to have another controller plug in and help sort the traffic out.

On paper, ASDE-3 would seem to be a marked improvement, especially with the add-on collision alert warning system. However, from the reports we have received from Pittsburgh, the equipment is still riddled with bugs, such as large aircraft producing as many as four separate targets. We seriously question whether the manufacturer will be able to meet the 1992 delivery dates. What are we supposed to do in the meantime?

The conflict alert system could prove to be worrisome, especially in light of controller experiences with the unreliable radar conflict-alert mechanisms and the high number of false alarms that TCAS and conflict alert are producing. NATCA's Safety Committee Chairman estimates that the conflict alert in the center environment is wrong at least 50 percent of the time; the figure for TRACONs and terminals could be as high as 70 percent. Given the abysmal record of FAA's conflict alert system, NATCA hoped that TCAS technology would be better. However, TCAS often gives false instructions, and in the terminal control area, many pilots turn off TCAS below 10,000 feet because of the constant false alarms.

In view of the tarnished history of conflict-alert equipment, NATCA is concerned that a similar situation might be waiting in the wings with ASDE-3. If the system cries wolf, controllers will not look upon it as a valuable tool but rather as another example of unreliable FAA technology not living up to promise. We also wonder how much time the ASDE-3 conflict alert will give the ground or local controller to react. Will ASDE-3 prevent an accident, or will it just sound an alarm to announce that an accident is already in progress?

Because of short staffing and poor equipment performance, procedures and airport layout became crucial. NATCA strongly supports efforts by the Air Line Pilots Association to standardize signs, lighting and markings at airports. Many of our airports are baffling places to negotiate, especially at night when the runways and taxiways become a sea of lights. For example, one taxiway at Miami changes names as it goes from one side of the terminal to the other. Who would not be confused? NATCA can think of no logical reason why the industry and the FAA cannot come up with a nationwide standard for runway/taxiway identification. It would be of enormous help.

NATCA was also interested to hear that the FAA finally decided to limit operations from intersecting runways. One controller at JFK told us that "once you get fancy, you increase the chance for human error." However, this blanket approach might actually end up hampering safety by causing increased delays and airborne congestion. A better approach would have been to examine the terminal facilities on a case-by-case basis and then decide whether the harsh medicine was appropriate.

Communications between controllers and pilots is also a problem. We appreciate ALPA's suggestions mandating read backs of all clearances and eliminating the use of multiple frequencies by a single controller during times of limited staffing. However, these are not feasible because of short staffing and workload. There is little opportunity to interrogate a pilot or read back all clearances, especially if the controller is handling a dozen aircraft at one time and in bad weather. Delays would rise dramatically and I am unsure whether this would be palatable to the industry and Administration.

Communications with foreign carriers (and increasingly ground vehicle drivers) is also a major concern as they require greater attention in the air and on the ground. This places an increased work load on controllers who must still handle other operations while trying to break through a language barrier. As we learned from the Avianca 52 crash, controllers are often dealing with foreign flight crew members who do not fully understand established and standard phraseology. On the one hand, the FAA requires that the English-speaking flight crew member be knowledgeable of ATC rules and procedures, including phraseology, but on the other hand, it has no monitoring mechanism to insure compliance. Obviously, the FAA is falling short of its obligations. We would add too that this problem will only get worse if aviation cabotage laws are repealed, producing a massive influx of foreign carriers and pilots.

NATCA further suggests a ground and local program for foreign carriers modeled along one made by ANA All Nippon two or three years back. The carrier requested that controllers from Washington and New York Centers fly with their pilots to explain the airspace, procedures and phraseology. It was the equivalent of a familiarization, or FAM flight, but it was for the pilots' benefit. Unfortunately, for staffing or other reasons, the project was shelved, but that does not mean that the concept was flawed. It is also our understanding that Japan Air has a program based in the NAPA Valley where its pilots come over to train from day one, so that they become totally familiar with the phraseology, language and airspace. Rather than a sterile textbook, this is a hands-on method of showing the ropes to foreign pilots new to the U.S.

General aviation pilots can also tie up ATC personnel. Controllers find themselves engaged in lengthy communications with general aviation pilots who are often requesting something as simple as a clearance or flight filing. In the process, overloaded frequencies and an already short-staffed work force are tied up.

One cannot blame the general aviation pilots. NATCA's Safety Committee Chairman, who has been a controller for almost 20 years at the Washington Center, told me that if he has a moment, he will explain to the pilot correct phraseology. One pilot with 20 years of flying under his belt thanked him, saying that for the first time he knew the right way to request a VFR flight filing.

Although the Aircraft Owners and Pilots Association is trying to provide phraseology information to its members, it is the FAA which should accept the ultimate responsibility for ensuring that general aviation pilots have solid phraseology and communications skills. At the very least, a basic course in phraseology should be required in initial pilot training and students should be tested on it to receive certification. In addition, the FAA should stress frequency discipline. Many general aviation pilots key their mikes without waiting to hear if someone else is on the frequency, causing a squelch in the controller's ear. A firm foundation in these basics, followed by an examination would produce better pilots and a safer and more efficient air traffic control system.

Given what I have just said, I find it exasperating that on November 1, 1988, I stood next to then FAA Administrator T. Allan McArtor as he announced the Pilot/Controller Communications Awareness Initiative or "Call to Action." This massive education program was supposed to "foster improved communications between pilots and controllers as a means of reducing system operations problems, increasing user professionalism and enhancing system safety." The professional group of aviation users and providers, or "Initiative Working Group," of which NATCA was a member, identified 12 problem areas which it hoped could be addressed through an "extensive information campaign," including a mass distribution of the "Call to Action" brochure.

What happened to this so-called campaign? Your guess is a good as mine. The FAA stated it "fully" supported the plan and urged each system user "to respond to this 'Call to Action' by making a commitment, as FAA has done, to increase system efficiency and safety through improved communications." However, the majority of controllers never received the "Call to Action" brochure; most copies are probably still sitting unopened in their packing boxes. We can only assume that the FAA's commitment to the program and document was fairly short lived, or perhaps the initiative fell though the cracks as so much does given the very short tenure of the Agency's administrators.

NATCA, and I am sure most of the other organizations who participated in the Initiative, want to see the FAA recommit itself to the "Call to Action." Those 12 areas of vital concern are as vital today as they were two years ago. The concerns have not gone away, the only thing that has is the program.

Before this hearing, NATCA also looked into a few other programs that are supposed to stem the number of runway incursions. For instance, there is the stop-bar system for intersecting runways and taxiways that was tested at Kennedy. Unfortunately it was hard to evaluate the program since the system was down more than it was functional. NATCA understands that the FAA is going to take another stab at it beginning March 1, 1991. However, from early reports we do have some concerns. First, is that the job of operating the stop-bar equipment not be combined with another controller position, or at least not until the program becomes effective. We are also worried that given the physical limitations of the technology, a vehicle, with its quick start, could beat the reaction time of the controller and still cause a runway incursion.

NATCA also examined the "Runway Intersection Identification Lighting System" at Boston Logan. Also known at "hold-short" marking lights, the program was well received by controllers at the facility but for some inexplicable reason, it was recently cancelled. Given the fact that Boston has only 20 FPLs and is authorized 34, and has a chronic runway incursion problem, one would hope that the FAA would use every means available to bring this problem in line. Hold-short was one of those means and the FAA should explain why it is no longer operational.

We also finally suggest that there should be formal coordination between working controllers and the various airport authorities concerning construction in and around an airport. Buildings and lighting and even trees and shrubbery can have an enormous effect on the ability of a controller to separate aircraft on the ground and in the air. Today, no one who is working traffic has this type of input; it is usually a manager or staff person removed from the actual operation. If we had such a structure, we might be able to prevent potentially dangerous construction from ever taking place.

In conclusion, runway incursions are not going to go away overnight. The FAA and the Department of Transportation have taken a piecemeal approach to the problem. Once again, they believe that technology will be their salvation. However, ASDE technology is only one part of the solution and could be part of the problem if we do not have enough full performance level controllers in the tower cabs to provide the experience and vigilance the air traffic demands. It is through more FPL controllers, reliable equipment, improved communications, pilot/controller awareness of the problem, procedures that place safety before capacity, and simplified and standardized signs that we can lick runway incursions. Half-measures will perpetuate the problem and half measures are all we have today.

STATEMENT OF JOSEPH DEL BALZO, EXECUTIVE DIRECTOR FOR SYSTEM ENGINEERING AND DEVELOPMENT, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, SUBCOMMITTEE ON AVIATION,, CONCERNING RUNWAY INCURSIONS. FEBRUARY 28, 1991.

Mr. Chairman and Members of the Subcommittee:

I am Joseph Del Balzo, FAA's Executive Director for System Engineering and Development. With me today are Mr. Norbert Owens, Deputy Associate Administrator for Air Traffic, and Dr. H. Clayton Foushee, Chief Scientific and Technical Advisor for Human Factors. We are pleased to have the opportunity to appear before the Subcommittee today to provide you with details of FAA's efforts to reduce runway incursions, which are a source of concern to us all.

The recent tragic accidents in Los Angeles and Detroit highlight the seriousness with which we must approach the difficult task of combatting the threat of surface collisions. We deeply regret this tragic loss of life, and assure you that we are committed to do all we can to avoid a repetition. As I will describe, we have an aggressive program through which we plan to drive down the incidence of runway incursions.

As the Subcommittee is aware, the National Transportation Safety Board, consistent with its statutory mandate and with FAA participation, is currently conducting detailed investigations of the recent accidents. In view of that ongoing investigation, we are, of course, unable today to discuss any of the particulars associated with the accidents.

RUNWAY INCURSIONS

A runway incursion is "any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing, or intending to land." Each runway incursion--since it by definition involves a collision hazard or loss of aircraft separation--is of concern to the FAA, and we have taken a variety of steps to reduce their occurrence, as I will shortly describe. However, reducing the threat of runway incursions is a very difficult problem since they involve an almost infinite variety of potential situations, circumstances, and people.

Careful analysis of runway incursions has given us substantial data, which has enabled us to work systematically to address the problem. We have found that runway incursions are primarily caused by one or a combination of four primary factors: clearances; communications; ground navigation; and awareness. A review of accident data over the 15 years from 1975 through 1989 reveals that a small proportion of all airport accidents have involved runway incursions--93 out of 2,988 accidents, or 3.1%. Data also show that there are 3 times more surface collisions than midair collisions, yet midair collisions produce 3 times more fatal accidents. Nevertheless, as recent accidents show, runway incursions represent the potential for catastrophic tragedy. And, while increases in reported runway incursions from 1988 through 1990 may be attributable to heightened awareness and improved reporting, the fact remains that runway incursions are a safety threat which requires firm resolve and committed actions from all segments of the aviation community--government, airport operators, airlines, pilots, and all individuals present on airports.

RUNWAY INCURSION PLAN

Recognizing the need for a concerted, systematic effort to address the threat of runway incursions, Administrator Busey called for a study of runway incursions which culminated in an April 1990 report. What we learned led to a more recent effort to develop a Runway Incursion Plan. That Plan, copies of which have been provided the Subcommittee, was finalized January 24, 1991. I would like to address briefly some of the features of the Plan.

One key element of the Plan is that it involves all key operational and research elements of the agency. Through this approach, we are focusing both high level attention on the problem and assuring that the overall effort integrates the expertise and carries with it the authority of all key players in the FAA. We have also established an overall program manager both to see that nothing falls through the cracks and to be accountable for producing timely, concrete results.

We have established a Quality Improvement Team on Runway Incursions to serve as a working group of agency experts to recommend solutions and priorities in the overall effort. To ensure that we receive full input from affected parties outside the agency, we are establishing under the FAA R,E&D Advisory Committee a Runway Incursion Working Group, to be chaired by J. O'Brien of the Airline Pilots Association, in order to offer industry and user participation and advice.

Our Runway Incursion Plan identifies some 25 initiatives underway during this fiscal year, on a broad range of fronts. Each of these initiatives will add an additional measure of safety.

We are undertaking a systematic review of our concept of how we control surface movement of aircraft and vehicles. This systems approach is designed to define and sharpen policy and procedural issues relating to fundamental ways we need to change in order to address the increasingly greater demand for use of the Nation's airports. We propose to have an FAA team create a vision of how ground movements should be controlled today, between 1995 and the year 2000, and then look to longer-term technologies which can further improve safety and efficiency.

We will not be able to do this alone. We will ask our Runway Incursion Working Group to react to this systems analysis and help in forming this vision of change on how we operate on the ground.

Runway Incursions are human errors, shared by the controller, the pilot, or a vehicle operator. Human factors play a major role in runway incursion prevention. The agency has a new Human Factors Plan which addresses controller workload, scanning, and memory techniques. Our long term research has human factors at its core, as it must. Automation will provide assistance to the controller in dealing with the complexity of today's airport operations, but cannot entirely supplant the human element.

We have a variety of research and development actions ongoing to address prevention of runway incursions. I would like to briefly give you the status of these efforts:

o At Boston, we are just completing testing of an inpavement lighting system to allow pilots to land and hold short of an intersecting runway. We are now interviewing pilots who have used the new lighting cues, and expect to complete the effort by this Spring.

o Both the Northwest-Mountain Region and the Central Region's towers now have installed the runway incursion device (RID) on their tower communications headsets. The RID alerts the controller when a runway is closed because vehicles are on the runway. Funding in this year's budget will add this device to the remaining air traffic control towers.

o JFK testing of the stop-bar system resumes next month. The stop-bars needed modification to reduce activation delays. While these stop-bars will initially be operated by the controller, we believe they can be controlled automatically, eliminating the potential for human error. Assuming the tests of stop-bars at JFK are a success, we can incorporate them in our strategy for ground movement of aircraft.

o An FAA/Industry group is expected to complete a draft advisory circular on low visibility ground operations this March. This coordinated effort will specify procedures for operating on the ground to visibilities below 1/4 mile.

o We are currently in the fourth year of our three-phase Airport Surface Traffic Automation (ASTA) research program. An important part of this research is an enhancement to the Airport Surface Detection Equipment (ASDE-3) to provide aural and visual warnings to the controller of runway incursions. This enhancement, called AMASS for Airport Movement Area Safety System, is an outgrowth of earlier conceptual work by the MITRE Corporation, and work by Norden Systems, manufacturer of the ASDE-3. We expected to award a development contract to Norden Systems in July 1990; it actually happened in September. We have already seen a prototype demonstration at our Pittsburgh ASDE-3 testbed site. We will be installing AMASS at the FAA Technical Center to test the interface with the ARTS system early this Summer, allowing us to look out into the approach path to detect an arriving aircraft and to integrate it with radar returns detected by the ASDE-3.

A first ASDE-3 test unit is being shipped to the Technical Center in July to support this effort. Early interface testing will precede the shipment of the ASDE-3 to reduce development time. In December, a second ASDE-3 test unit will be in place at San Francisco to begin validation testing of the pre-production version of AMASS. San Francisco was selected because it has a training control cab below the operational cab, allowing us to do validation testing within a real air traffic control environment without impacting day-to-day operations. The validation test is expected to run through April 1992. Assuming early results of this developmental program are positive, the FAA has begun a parallel effort to award a production contract to Norden Systems for the AMASS technology. The first operational AMASS enhancement to ASDE-3 can be expected two years after award of the production contract.

AMASS is tied to the ASDE-3 production and delivery schedules. We need ASDE-3's to test and complete design of AMASS. We are now nearly four years behind schedule on delivering ASDE's. Norden Systems has been experiencing technical problems with their antenna production process. They now believe that there is a fix for a delamination problem and are working to correct the problem.

While we have been disappointed by the delay in delivery, the enhancements over the limited number of old ASDE-2's will be substantial. The average mean time between failure of the ASDE-2 is on the order of a failure every 200 hours of operation; roughly a failure every 8 days. The ASDE-3 requires a mean time between failure of at least 2000 hours, 10 times better than the ASDE-2. The ASDE-3 is a solid state radar with excellent target detection in heavy weather.

We are now negotiating with Norden Systems on the delivery schedule for the first production units. Los Angeles and Detroit are expected to receive their ASDE systems in July 1992 and to be operational by October.

I would like to briefly touch on Airport Surface Traffic Automation, which began in FY 1988 with concept development. ASTA is addressing four priorities: prevention of runway incursions; delivering data tags to ASDE targets so controllers can quickly identify aircraft; providing a method through Mode S data link to bring surface traffic data directly into the cockpit; and providing an automated means to sequence departures to gain capacity and reduce delay.

The program is split into three phases, applying the key principle of safety before capacity. ASTA-1 provides the enhancements to AMASS and a method to automatically control runway lights which will advise pilots when a runway is "hot". If an aircraft is on takeoff roll, lighting at runway access points will be red. As soon as the aircraft is off the runway, these lights will revert to their amber color scheme. In addition, there will be lights on the runway itself, warning the pilot who is landing or taking off of a runway incursion. The system concept has been developed by MIT's Lincoln Laboratory. We have asked Lincoln to speed up a demonstration of the concept, so as to be complete by the end of 1992. We want to encourage lighting manufacturers to participate in this demonstration in order to accelerate implementation of the technology. The technical risk we face in this program is in developing the software to alert of potential conflicts and send signals to the lights.

We are designing experiments now to take advantage of low cost ($1.5 million per site) alternatives to ASDE-3 so we can use the runway status lighting system at any airport, regardless of whether or not there is an ASDE-3. The demonstration will involve radar surveillance with appropriate software to light a mockup of Boston Logan airport. Pilots and controllers will be able to view the radar imagery, see the aircraft actually operating on Logan, and watch how the lights would be switched from amber to red as the aircraft move on the ground or arrive at the airport.

ASTA-2 is a longer term effort relying on Mode S beacon surveillance. Beginning in 1995, all newly installed transponders must be Mode S. Accurate aircraft positioning and tracking will eliminate clutter problems inherent in radar and provide the controller with a clean visual depiction of aircraft and ground vehicle positioning. We expect an operational ASTA-2 system as early as 1997. While that is longer than we would like, we need to gain some operational experience with Mode S-equipped aircraft before we can field an operational system.

ASTA-3 is the next iteration of surface automation, providing a direct data link to the cockpit and facilitating departure sequencing management to gain capacity. This effort will link the ground with the air systems such as Terminal Air Traffic Control Automation, which we expect to begin demonstrating in 1995.

As I mentioned earlier, we are taking a systems approach to examining how air traffic control should be accomplished on the ground. Technology changes will have a profound effect on our approach to surface movement at an airport, but they are not the sole solution. The systems approach requires that we consider the people, equipment, and procedures with a view toward improvements which can assure safety and help us operate at peak efficiency to reduce delays.

As a result of the Detroit and Los Angeles accidents, universities, companies and individuals have come forward with alternatives addressing runway incursions. Our centralized focus has helped us ensure that these ideas are getting the attention they deserve. Our program manager has already been contacted by over 30 firms and individuals. Many of these have technologies used in other applications. We are meeting with everyone who wishes to describe their concepts. We have taken a very open-minded approach to gaining help to address the problem. In order to test some of these ideas, we will be issuing a Broad Agency Announcement on technology alternatives later this Spring. Depending on available funding, we will support as many demonstrations of alternative technologies as possible. While prior research efforts have focused on enhancements for ASDE-3-equipped airports, this effort will consider all commercial airports.

While much of my description has focused on technological improvements we are seeking, this is only one element of our total program. Our Plan covers the full spectrum of activities. We are working, for example, to improve visual aids at airports, including standardization for signage and markings. The Administrator has already announced a commitment of $30 million in Airport Improvement Program grant funds to test state-of-the-art advances in runway marking, lighting and signs at four demonstration airports (Boston, Seattle-Tacoma, Pittsburgh, and the new Denver airport, which is expected to open in 1993). We also are setting aside $20 million in airport grant funds to finance projects for standardizing runway signs and other visual aids at airports throughout the country.

Added controller aids are being explored--controller memory enhancement being a part of that effort. Educational and awareness efforts for all segments of the aviation community are being undertaken. Posters, pamphlets, bumper stickers, audiotapes, videotapes, and seminars are likely tools in this effort. The FAA Academy has just taken delivery of our first tower cab simulator, which can simulate runway incursion scenarios to add a "real life" element to our controller training programs. In addition, both pilots and controllers will be provided new opportunities to learn from information concerning actual runway incursions that we will maintain in our expanding data base and provide as training scenarios.

We anticipate continued strong actions on virtually all fronts to address the problem of runway incursions, one example being the action taken by Administrator Busey on February 15 limiting position and hold clearances for intersection takeoffs between sunset and sunrise or when the intersection is not visible to the tower cab.

In closing, Mr. Chairman, let me restate the FAA's deep concern over the Los Angeles as well as the Detroit accident. In concert with the NTSB, we will do all we can to learn from these tragedies in order to take steps to avoid their recurrence. You may be assured that we are working aggressively and systematically to reduce the threat of runway incursions. I feel strongly that the basic program I have described today will do much to accomplish that important objective.

That completes my prepared statement. I would be pleased to respond to questions you may have at this time.

Statement of J. Roger Fleming,
Senior Vice President, Technical Development and Planning
Air Transport Association of America
Before the House Committee on Public Works and Transportation
Subcommittee on Aviation
on The Problems of Ground Collisions and Runway Incursions
February 28, 1991

Mr. Chairman, members of the Subcommittee, my name is J. Roger Fleming. I am Senior Vice President, Technical Development and Planning of the Air Transport Association of America. I appreciate the opportunity to appear before you today to present our views on an important safety issue -- insuring the safety of aircraft operations on the airport surface.

NEED FOR ACTION

The accident which occurred at Los Angeles on February 1 served as a reminder that the FAA and the entire aviation community face an as yet unfulfilled challenge to identify and implement a comprehensive, integrated and systematic set of measures to significantly reduce the chance of collision on the ground between aircraft or between aircraft and other objects, such as vehicles. This is not a simple challenge. FAA will have to exert strong leadership and management to achieve the needed result.

Fatal accidents involving collisions of transport aircraft on the airport surface are rare events. Statistics reported by FAA in the agency's January, 1991 "Runway

Incursion Plan" reveal that there were eight such accidents in the 1975-1990 time frame. The accident at Los Angeles on February 1 is the ninth since 1975 involving air transport aircraft operating on the airport surface. Unfortunately, we can take little comfort from these statistics because there has been a collision on the ground involving an airline aircraft in each of the last three years.

As you know, the term used by FAA to describe incidents on or around runways is "runway incursions." FAA statistics on runway incursions are generally accepted as good indicators or precursors of the potential for accident on or near the runway. FAA accumulates and reports these incidents periodically in their "Runway Incursions Report." I will not recount comparative statistics here since they are readily available to you from the FAA. However, there are sufficient numbers of incidents (272 in 1990) to reinforce our mutually held belief that there is need for aggressive action to reduce the risk of collision on the ground.

THE HUMAN ELEMENT

National Transportation Safety Board (NTSB) reports of their investigations of ground accidents, runway incursion reports and special FAA and NTSB studies of ground safety issues all reveal one common and significant thread -- human error on the part of both pilots and controllers. On March 6, 1990, Dr. John Lauber of NTSB, testifying before the House Subcommittee on Transportation, Aviation and Materials stated, while discussing sources of controller human error:

> "The term 'forgot' or 'forgetting' is a factor that we saw extensively in our special study of runway incursions. And it's one of the real human factors issues that's involved in this whole business.
>
> "The way we operate the air traffic control system today -- and especially that part dealing with ground operations -- places a very great burden on the individuals who have to operate it.
>
> "And among the burdens imposed upon those individuals is one having to do with memory. They are forced, by the very nature of the task, to remember for the short-term a number of significant facts and circumstances that pertain to their immediate situation.
>
> "It's an unfortunate characteristic of human short-term memory that it's very easily disrupted by any kind of distraction. Anything that tends to interfere or draw the attention of the individual can have serious effects, disruptive effects on short-term memory. And we see that factor repeatedly in these runway incursion incidents."

Dr. Lauber, who is a recognized human factors expert, continued by noting that, "Basically the system, the way we're operating it, demands nearly error-free performance. And that just isn't the nature of the beast. Human beings are subject to various kinds of errors in various situations. And the challenge is to design a system -- an air traffic control system in this case -- which is tolerant of those errors when they do occur, and which detects and traps them before we have near collisions or, quite obviously, actual collisions."

The importance of adequately considering the human element was underscored by the airlines in 1989 when they, in cooperation with other aviation community members, developed the "National Plan to Enhance Aviation Safety through Human Factors Improvements." This plan served as a catalyst. FAA then developed its "National Plan for Aviation Human Factors." Both plans identify near- and long-term actions needed to improve knowledge of human performance and causes of error, and to identify ways to use this knowledge to improve safety.

THE CHALLENGE

Dr. Lauber's words were prophetic in light of subsequent accidents at Detroit and Los Angeles. The challenge is clearly to develop and implement a system which is tolerant of the possibility of human error by pilot, controller or other persons who may be working in proximity to active runways. The challenge is thus one of dealing effectively with the human factors aspects of safe operation on and around the runway. New air traffic control hardware and software and improved runway markings, signage and lighting may be needed at some airports but individually are not guaranteed solutions. What is required is a thoughtfully conceived and integrated approach to resolution of the human performance issues, not an uncoordinated, shotgun approach that could result in counterproductive measures.

FAA's "Runway Incursion Plan" represents a promising approach to the challenge. The authors of the plan recognize the significance of human factors issues as evidenced by the following statement from that plan: "Work on detailed understanding of human factors will go the furthest in reducing runway incursions." Appendix A to the document notes that FAA has 25 major initiatives currently underway to address runway incursions and improve safety on and around runways and other airport movement areas, and that many of these initiatives involve more than one FAA organizational element. The complexity of this effort will pose formidable management problems for FAA. The plan also includes an organizational structure providing for industry input to resolution of the issues. ATA staff and airline representatives are already involved with FAA and other elements of industry on several tasks related to runway signage, surface marking and lighting and management of surface traffic movement under conditions of reduced visibility. These advisory groups will need strong management direction from FAA to assure an integrated approach as recommendations are developed and to insure that human factors issues are satisfactorily resolved.

Important issues and questions will have to be addressed as these joint government-industry efforts progress. Some of the issues and questions follow:

- TCAS II (Traffic Alert and Collision Avoidance System) is being installed in airline aircraft to serve as a backup to the ATC process to reduce the risk of midair collision due to human error. We believe similar backup capability is needed on the ground. The best means to introduce redundancy (or backup capability) in the traffic control process employed to assure safety of operations on the airport surface must be identified, given the possibility of human error that may lead to accidents. Are we to rely on automation aids and, if so, which aids and at which airports? Only the busiest?

- Communications, navigation and surveillance functions (CNS) are fundamental elements of the airborne ATC process. Efficient and safe control of aircraft on the ground will require the same set of capabilities. How are these capabilities to be provided in the future?

- What roles do ASDE-3, AMASS (Aircraft Movement Area Safety System) and ASTA (Airport Surface Traffic Automation) play in satisfying the CNS requirements and in providing redundancy to help avoid the consequences of human error? When are such systems to be introduced in the system and at what airports?

- What enhancements to ASDE-3 are planned and how widely are they likely to be implemented? Are such enhancements integral parts of AMASS and ASTA? We recommend a building block approach for these systems.

- ASDE-3 is an expensive surface surveillance device partly because it was designed to function in periods of heavy precipitation, which are rare at many airports. We conclude that an automated system should be introduced at a large number of airports to provide backup to pilots and controllers to reduce the consequences of human error. Therefore, we believe FAA should be considering development of a lower cost surveillance system that will operate full time. Such a system would also satisfy the operational requirement at airports with little severe weather or low traffic volumes, or both.

- Data link could play an important role in reducing clearance misunderstandings. Which system might best be employed for such service? Are there other ways to improve communications between pilots and controllers?

- Highly sophisticated systems such as AMASS and ASTA will be employed at some subset of our airports. What are the implications for signage, marking and lighting requirements? Should the requirements be the same at all airports?

- Standardization is important in airport signage, marking and lighting to reduce the possibility of pilot error in maneuvering on the airport surface. Since a significant number of U. S. and foreign pilots operate international flights we need to make a commitment to adopt U. S. standards that are consistent with international standards. Is this objective being pursued with sufficient commitment?

- What are the most promising enhancements to pilot and controller training programs that will help to reduce human error during ground operations?

- Are there ATC procedural or staffing changes that should be introduced to reduce the possibility of human error in the control facility?

- Are there changes that should be introduced in the cockpit to reduce the chance of human error?

NEAR TERM ACTION REQUIRED

FAA has already undertaken the initial steps to implement the action program outlined in the Runway Incursion Plan. The early emphasis should be placed on the set of issues related to airport signage, marking and lighting, to any additional improvements that could be made to controller, and pilot training programs and to possible procedural safeguards that might be introduced or reinforced in the short term.

In addition, FAA needs to press for resolution of the ASDE-3 developmental problems so that deployment of this controller surveillance aid can be expedited. The timetable for completion of development work on the "incursion warning module" that can augment the ASDE capability with aircraft position information from both ASDE and the terminal ATC radar needs to be moved forward in time. This augmentation, which includes use of algorithms to determine whether there is risk of collision on the ground is part of the AMASS concept and would be valuable in providing backup capability.

ATA and its member carriers will assist FAA in every way possible to achieve these objectives and, as I previously noted, work is already underway on most of these projects. What will be needed is strong and effective guidance from senior FAA management.

THE LONGER TERM CHALLENGES

Automation of airport surface traffic management functions is clearly a task that will require dedicated effort over a prolonged period. The potential benefits to safety and airport capacity warrant the effort, in our view.

Government and industry need to aggressively pursue the human factors initiatives identified in the human factors plans. Adequate funding and other resources must be supplied, and there needs to be a commitment to implement the lessons learned.

Another important set of problems must be addressed. Those problems concern the inordinate complexity of the government procurement rules under which FAA must operate. This Committee, in conjunction with airport/airway reauthorization legislation last year, supported steps to begin addressing ongoing procurement problems. Nonetheless, the shortcomings and complexity of that process contribute to the lengthy period of time required to procure and install complex systems such as ASDE and other elements of FAA's Capital Investment Plan. Far-reaching procurement reform is essential if the agency is ever to be able to implement safety and capacity enhancements in a timely manner, to satisfy the interests and needs of the traveling public.

Procurement -- especially the impediments to rapid acquisition of complex systems -- is such a complex and highly specialized subject that few who are outside the government acquisition process can understand why the process is so slow and cumbersome. Perhaps, Mr. Chairman, it would be worthwhile to consider requesting a capable body such as the General Accounting Office to undertake a comparative study of acquisition of complex systems by FAA with successful acquisition of similarly complex systems in the private sector. The objective would be to identify elements of the current government procurement process that might be changed to improve the quality and timeliness of the product that is intended to serve the public interest. Change is required if FAA is to be able to quickly implement needed safety enhancements.

This concludes my statement, Mr. Chairman. I would be happy to answer any questions you may have.

STATEMENT OF

CAPTAIN DAVID HAASE
EXECUTIVE CENTRAL AIR SAFETY CHAIRMAN
AIR LINE PILOTS ASSOCIATION

BEFORE THE

SUBCOMMITTEE ON AVIATION
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
U.S. HOUSE OF REPRESENTATIVES

FEBRUARY 28, 1991

RUNWAY INCURSIONS

Mr. Chairman and members of the subcommittee, ladies and gentlemen. I am Dave Haase, Executive Central Air Safety Chairman for the Air Line Pilots Association. I am accompanied today by John O'Brien, Director of the Engineering and Air Safety Department.

ALPA represents 42,000 pilots who fly for 51 airlines, and we appreciate the opportunity to share our views on an area of extreme importance, runway incursions. There are few safety-related issues in aviation that deserve greater consideration than this one and we applaud you for helping to focus attention on it.

Time will not permit a detailed briefing on our runway incursion prevention positions, so I've submitted background papers dealing with this subject to committee staff. We have also supplied copies of correspondence and other documentation which provides a "paper trail" of ALPA's efforts in this regard, along with pertinent FAA regulations and ICAO standards and recommended practices.

OVERVIEW

Tragically, the recent runway incursion-related accidents at Detroit and Los Angeles are but the latest in a long history of fatal runway incursions. The 1977 ground collision of two 747 aircraft on Tenerife in the Canary Islands still holds the aviation record as the single accident to claim the greatest number of lives, with 583 fatalities. Since that tragedy, there have been a number of fatal incursions and also near collisions that have been avoided only by the narrowest of margins. On a foggy day in January 1990, a Continental Airlines 727 was cleared into position on a runway with a hold-for-takeoff, while another Continental 727 was cleared to land on the same runway. A successful last-second go around by the landing aircraft was made, narrowly averting catastrophe. Two weeks later, in another accident scenario similar to the recent one in Los Angeles, an Eastern Airlines jet collided with a small turboprop aircraft on a runway at Atlanta.

As you might infer, the issue of preventing runway incursions is near and dear to us as users of traffic separation services and equipment at commercial airports. In that regard, I must tell you that we are concerned over what we see as a distinct lack of standards for equipment and procedures aimed at reducing the potential for runway incursions. From the line pilot's perspective, there has been virtually no improvement in either the quality or quantity of runway incursion prevention measures in this country for many years. One need only look at today's airport congestion to realize how this problem will become even more exacerbated when the forecast growth for this decade and beyond materializes.

Before going further, it may be helpful to define the meaning of a runway incursion. FAA defines an incursion as "an occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing, or intending to land." We believe this definition is not broad enough in scope and overlooks some of the ways in which actual accidents and incidents have occurred. We define an incursion as "an unauthorized or inappropriate entry onto a runway, into a runway safety area, or into an ILS critical area by an aircraft, vehicle or person." We have encouraged the FAA to adopt the ALPA definition for reporting purposes, but it has not, until this time, done so.

PHILOSOPHY

The remainder of my remarks will center around our philosophical perspective of incursions, their causes and our proposed solutions. At the outset, an understanding of responsibilities is essential to a discussion of runway incursions. The air traffic controller is responsible for evaluating both current and anticipated movement of aircraft at the airport facility which he controls, formulating a plan for that movement to maximize safety and efficiency, and transmitting clearances (a fancy word for instructions) to aircraft to implement that plan.

The pilot, or flight crew in the case of airline operations, is responsible for correctly interpreting the ATC clearance, navigating in accordance with it, and maneuvering the aircraft in such a way as to follow it. If any of these responsibilities is not accurately carried out, the potential for an incursion may increase dramatically.

One potential fix for the problem is the use of advanced airport surface detection radar equipment. The procurement and installation of this radar, also known as ASDE-3, has been progressing at a snail's pace for 10 years. ASDE installed in the air traffic control tower enables controllers to visualize the movement and location of all traffic on the airport, regardless of prevalent visibility conditions. This equipment has been installed at Anchorage, Alaska, and the controllers there are most enthusiastic about it and rely upon it to a great extent for traffic separation. A test program has also been in effect at Pittsburgh for some time. However, at this location, the radar has only been available for controller observation in an equipment room and not for use in the tower. As we have said on several occasions, the agency needs to expedite its purchase and use of ASDE-3 to enable controllers to "see" aircraft under their control in all weather conditions. While it is scheduled for future installation at 29 airports, we believe it should be available at all of our busy locations and particularly those where low visibility Category II and III operations occur.

We are realistic enough to acknowledge that ASDE III only represents one element in a total package that is required to effectively control the incursion problem. A more basic requirement and one that can and must be implemented at all airports is effective signage, airfield markings and low tech lighting, all of which could be available in a much shorter timeframe. These items form the basic core of any incursion fix and should receive priority attention.

CAUSES OF INCURSIONS/BASIC SOLUTIONS -- CONTROLLER

Because runway incursions occur in so many different ways and under such varying circumstances, an understanding of the fundamental causes of incursions and some basic methods to address them is essential. The air traffic controller's most common causes of incursions are: inadequate or incorrect information; incorrect planning and projection of a plan for moving traffic; and, incorrect issuance of a clearance to pilots and ground vehicles.

One solution to these problems may very well include the use of another air traffic controller in the role of "tower coordinator" to act as a supervisor of the ATC ground and terminal area operation at the busiest airports during peak traffic periods. Technical solutions include use of surface detection radar along with artificial intelligence and controller inputs to warn of potential conflicts. One short-term solution to reducing frequency congestion and misunderstood clearances is the development and implementation of standard taxi routes on airports which I'll discuss more in a moment.

CAUSES OF INCURSIONS/BASIC SOLUTIONS -- CONTROLLER AND PILOT

Controllers and flight crews may jointly create two kinds of problems, namely inadequate communication and lack of validation of the clearance that is issued. Misunderstood clearances occur due to such complications as frequency congestion and the imprecise nature of verbal communications. The FAA has initiated some activity to address this problem and we all must encourage them to continue with an eye towards improving and perhaps simplifying phraseology and procedures. An area of particular concern is readback requirements. Under today's rules, pilots are not required to give readbacks of clearances in all circumstances. For purposes of clarification, a readback is a pilot's repeat of an ATC instruction to ensure that the proper clearance was received. Greater use of readbacks, to include the aircraft call sign, is necessary to reduce confusion. Also, some airports have, on their own, designated standard taxi routes that are depicted on charts and issued by controllers We believe more airports should follow this practice, as it does tend to reduce confusion and radio frequency congestion. Further visual confirmation of oral clearances are needed through the use of ATC-controlled stop bars, especially at airports used in low visibility. Some of these solutions I've described are short term, others will take longer to implement.

CAUSES OF INCURSIONS/BASIC SOLUTIONS -- PILOT

Pilots may independently cause two types of incursion problems: (1) incorrect interpretation of an ATC clearance; and (2) incorrect navigation in the performance of the clearance. In order to address these two problems, we believe that the concept of "drawing a red line around the runway" should be implemented. This red line represents the last line of defense around the runway and its immediate environment and should not be crossed until authorized to do so by ATC. The red line is drawn by the airport operator through standard, properly located runway designation signs and painted hold markings, and runway entrance lighting including flashing amber lights and ATC-controlled stop bars.

One of the most commonly heard concerns from our members is that airport markings, lighting and signs are inadequate for navigating on ramps, taxiways and runways. In order to address these concerns, the FAA must issue improved standards for these low-tech airport visual aids and they need to be implemented on an expedited basis. Another solution to pilot navigation problems are improved airline training programs designed to improve cockpit procedures and eliminate "heads in the cockpit" duties during the taxi phase of an operation. These solutions may be instituted on a short- to intermediate-term basis.

ACTIVITIES TO DATE

Now that I've outlined what we believe the problems are and how they should be addressed, let's look at what has been done thus far to meet the need. In 1986, FAA convened the first meeting of a joint government/industry working group on runway incursions which focused on airport visual aids. Several conclusions were reached, but more than four years later, not a single recommendation has been implemented. The responsibility for this inaction lies equally with industry and FAA.

In 1987, the FAA Administrator directed the Office of Aviation Safety to undertake an internal effort to identify the causes of incursions and recommend measures to prevent their occurrence. This program has thus far produced an April 1990 report, but there have been no significant improvements or changes made of which we are aware.

Most recently, the FAA formed a team last month after the Northwest Airlines accident to develop a runway incursion plan based in large part on its April 1990 report. The jury is still out, but we are hopeful that this team will be able to provide some much needed new guidance, leadership and activity in our efforts to prevent runway incursions. The FAA has also established an industry runway incursions working group of the FAA Research, Engineering and Development Advisory Committee. This working group is intended to assist the FAA in carrying out its runway incursion plan.

The International Civil Aviation Organization developed criteria for low visibility Surface Movement Guidance and Control Systems (SMGCS) in 1975 and updated it in 1986. The FAA is only now nearing completion of limited application criteria for SMGCS. ICAO has recently updated and vastly improved its standards and recommended practices for airfield visual aids criteria. The

U.S. has not implemented some of the most important of those standards with respect to runway incursion prevention. We hope that these international efforts will stimulate action in this country.

SUMMARY

In closing, I believe you will agree with us that the problem of runway incursions is a multi-faceted one which deserves much greater attention than it has received in the past. We believe that implementation of low-technology equipment and improved procedures is attainable today and should be implemented on an expedited basis to reduce the potential for any further accidents of the type which occurred at LAX most recently.

Thank you for your kind attention. I would be glad to respond to any questions you may have.

National Transportation Safety Board

Washington D.C. 20594

Safety Information

Testimony of

John K Lauber, Member

National Transportation Safety Board

before the

Subcommittee on Aviation

Committee on Public Works and Transportation

House of Representatives

February 28, 1991

Mr. Chairman, Members of the Committee, we are pleased to be here this morning to discuss the safety hazards of runway incursions and ground collisions to our travelling public.

The Safety Board is currently investigating three major accidents involving collisions between two airplanes on active runways.

On January 18, 1990, Eastern Airlines Flight 111, a Boeing 727, struck a Beech 100 after landing on Runway 26R at the Atlanta Hartsfield International Airport. The Beechcraft had landed ahead of the Eastern jet and had not yet cleared the runway as the B-727 touched down and rolled out. The Eastern pilot did not see the Beechcraft until about 1 or 2 seconds before the collision, which occurred about 3,500 feet from the touchdown end of the runway. The Eastern pilot attempted to swerve to the left, but the right wing of the 727 struck and sheared off the top of the Beechcraft, killing the pilot and seriously injuring the copilot. The local controller had been distracted by communication difficulties with an airplane that had just landed and by an in-flight hydraulic emergency with another airplane that had necessitated placing crash/fire/rescue equipment near the runway.

The investigation of this accident is completed, and the Board will be considering its final report in about 6 weeks. Some of the issues that will be examined by the Board are the controller's workload at the time of the accident, the conspicuity of the Beechcraft, and the separation criteria for the airplanes as they approached the runway.

On December 3, 1990, a Northwest Airlines Boeing 727 was on its takeoff roll at the Detroit Metropolitan Airport when it collided with a Northwest Airlines Douglas DC-9, which was taxiing from the ramp to the takeoff position. The reported weather was indefinite ceiling, sky obscured, and 1/4 mile visibility.

The collision and subsequent fire resulted in almost total destruction of the DC-9 passenger cabin above the window line. The No. 2 engine separated at impact, and the right wing was heavily damaged. Eight occupants of the DC-9 sustained fatal injuries; 21 persons were hospitalized (2 critical). There were 39 passengers and 4 crewmembers on board.

The right wing of the B-727 was heavily damaged. The one hundred forty-six passengers and ten crewmembers escaped injury and evacuated the airplane safely after it stopped on the runway.

The preliminary investigation has disclosed that the flightcrew of the DC-9 were unsure of their position on the airport as a result of the poor visibility and that they unintentionally taxied onto the active runway. The investigation of this accident is not complete, but the issues that are being examined include airport signs and lighting, taxi procedures during low visibility, pilot and controller communications, and FAA programs to develop technological solutions to the runway incursion problem. The investigation is also focusing on the ability of the passengers aboard the DC-9 to evacuate. The Safety Board will convene a public hearing in Detroit on March 18 to examine all of these issues.

On February 1, 1991, an accident occurred in Los Angeles involving a USAir Boeing 737 and a Skywest Fairchild Metro 3. The Metro was positioned on runway 24L awaiting clearance to take off from an intersection approximately 2450 feet from the approach end. At the same time the B-737 was inbound and cleared to land on the runway by the same local controller who had allowed the Metro to enter the runway. Twenty-two of the eighty-nine occupants of the B-737 and all twelve occupants of the Metro were killed in the subsequent collision and fire.

Our investigating team has only recently returned from the on-scene phase of the investigation. We still have a considerable amount of work ahead of us in examining the issues that could have contributed to the accident. These issues will include air traffic control procedures, controller workload, training, tower equipment, and, as in the Atlanta accident, airplane conspicuity. We are also examining passenger survivability issues in the context of this accident.

The Safety Board's concern about the runway incursion hazard has been long standing. One has only to remember the tragic accident on a runway at the Tenerife Airport in the Canary Islands on March 27, 1977, to realize the serious potential for runway incursions. Five hundred and eighty-three people lost their lives when two Boeing 747's collided--more fatalities than in any other accident in the history of world aviation. I cannot help but believe that if this accident had occurred on U.S. soil -- as it might well have -- the FAA would have given more attention to the runway incursion hazard during the past decade.

Fortunately, until recently, few ground collision accidents have occurred at U.S. airports, a record that is undoubtedly a tribute to the overall performance of our air traffic controllers and the vigilance of flightcrews. However, the accidents that have occurred and the numerous close encounters that we hear about two or three times every week convince us that we are relying too heavily on perfect human performance and luck to ensure the safety of landing and departing traffic.

In fact, two runway incursion incidents and one accident that occurred between June 1978 and February 1979 prompted the Board to recommend that the FAA conduct a directed safety study to examine the runway incursion problem and to formulate recommended remedial action to reduce the likelihood of such hazardous conflicts. That recommendation was issued in June 1979.

In response, the FAA commissioned the Transportation Systems Center in Cambridge, Massachusetts, to conduct a study. The study was completed in April 1981 with a report titled "An Analysis of Runway-Taxiway Transgressions at Controlled Airports." The study concluded that "there does not appear to be any pattern to the causes . . . other than human errors on the part of both air traffic controllers and pilots." The study also concluded that "more uniform communication and verification of messages between pilots and controllers could serve to reduce the chance of ambiguous or erroneous commands/actions." The report raised the question as to whether system reliability might be improved by increasing the reliability of the human element or by adding redundant elements. The study did not evaluate controller training or human performance issues. The study did suggest that incident reporting might be part of the problem since there were indications that all incidents are not reported, a situation that precluded appropriate corrective measures. Furthermore, the report did not propose any specific corrective measures.

Although the FAA did conduct the study on the runway incursion problem, the study did not result in the development of remedial action to reduce or alleviate the problem.

The Safety Board's concern about the problem was heightened again after it investigated a near collision between two DC-10's at the Minneapolis-St. Paul International Airport on March 31, 1985.

One of the airplanes was taking off after having been cleared by the local controller; the other was taxiing across the same runway after having been cleared by the ground controller. The captain of the airplane taking off realized that he could not stop and averted a collision by rotating the airplane and forcing it airborne at a speed well below the normal takeoff speed. The airplane overflew the taxiing DC-10, clearing it by 50 to 75 feet. There were 501 persons aboard the two airplanes, and several other airplanes were in the immediate vicinity of the taxiway/runway intersection.

If these airplanes had collided, the results would have been catastrophic. This occurrence prompted the Board to undertake a special investigation study of runway incursion incidents.

During 1985 and early 1986, the Safety Board investigated 25 more runway incursion incidents that were summarized in a special investigation report adopted on May 6, 1986. The Safety Board found that the incursions were the result of both controller errors and pilot deviations.

The report indicated that controller operational errors generally resulted from a coordination breakdown between local and ground controllers or distractions that diverted a controller's attention from an established conflict situation. Pilot deviations accounted for about 30 percent of the incursions investigated by Safety Board staff and involved misinterpretations of clearances and unauthorized runway crossings. Many of the incursions could have been avoided if the pilots had looked for traffic before proceeding onto an active runway.

Fourteen recommendations were sent to the FAA addressing issues such as procedures, training, pilot and controller communications and airport signing. The FAA took several actions in response to the Board's recommendations. These actions included establishing a runway incursion data base, distributing training material, including a video tape to bring controller and pilot attention to the problem, changes to controller and pilot phraseology, and placing more emphasis on airport taxiway guidance signs.

The FAA also established a Runway Incursion Task Force, including operational, controller, airport and research and development personnel to study the problem. The task force's effort culminated with the issuance of a draft report in September 1989, in which the task force included several more recommendations. Among them was a recommendation for the accelerated application of technological solutions.

It is obvious from the continuing occurrence of runway incursions -- 249 that were reported by FAA during the first 11 months of 1990 -- and, of course, from the recent major accidents, that more positive measures are needed.

Moreover, the Safety Board believes that the runway incursion hazard will continue to grow as the number of operations at existing airports increase; we cite the FAA's own projection of 64 million operations at towered airports in 1990 to more than 80 million operations in the year 2000. In fact, the FAA expects 67 commercial service airports to experience significant congestion by that time.

The Safety Board has been concerned that the major programs of both the National Airspace System Plan and the FAA Plan for Research, Engineering and Development focus primarily on increasing the capacity of the ATC system and increasing the acceptance rate of existing airports. Until now, the plan has given only limited attention to the hazard of collisions on the airport surface. The improved Airport Surface Detection Equipment (ASDE-3 radar), currently being tested at Pittsburgh, is intended for installation at only 30 of the 560 airports serving scheduled air carriers. This system, intended to aid controllers during poor visibility conditions, will provide an improved means of detecting pending surface conflicts. However, ASDE will be effective only if the controllers are observing the radar display, which is unlikely during good visibility conditions.

The Airport Surface Traffic Automation program included in the FAA Research, Engineering and Development plan will build upon terminal and surface surveillance radars to apply ATC traffic management technology to airplanes moving on the airport. One feature of the system will produce alarms to bring a controller's attention to potential conflicts similar to the highly effective airborne conflict alert software. A prototype of this ground conflict alarm feature is also being tested at Pittsburgh. We understand that there are some technological problems yet to be resolved but that the system does appear promising as a partial, albeit not total, answer to the prevention of these accidents. In any event, technological solutions will most likely not be implemented for several years. Thus, the FAA must also look for more immediate actions, such as the standardization of, and requirements for, airport signs, markings and lighting; the development of improved controller training programs; and aids to enhance controller performance.

The Safety Board also believes that the FAA must pursue a longer term program to develop a system that will provide surface conflict alert information to pilots that is independent of controller action. Such a system might use traffic light concepts or data link transmission directly to the aircraft. Further, the FAA must consider the ultimate expansion of the ASDE-3 program or the development of a more cost-effective system to provide runway incursion protection at more airports than the 30 currently scheduled for ASDE-3 installations.

We are aware that the FAA has recently issued a Runway Incursion Plan that will provide a new focus on the problem. The plan incorporates many of the elements previously recommended by the Safety Board, and we will be closely monitoring the FAA's progress in implementing this plan. We plan to question FAA and industry officials about this plan at the public hearing in Detroit in March.

In summary, the Safety Board views runway incursions as one of the most significant hazards to aviation today, and we expect that the potential for a ground collision involving an arriving or departing airplane will increase as the airport capacity enhancement programs become effective. We will continue to urge the FAA to place greater emphasis on the runway incursion hazard.

We strongly support the actions taken to increase controller and pilot awareness of the problem -- improved communications, controller coordination, and airport signing. However, we believe that the most effective accident prevention measure will be the installation of equipment capable of automatically detecting pending collision situations and alerting controllers and pilots to the need for preventive action.

Mr. Chairman, that completes my statement. I will be happy to respond to questions.

STATEMENT OF THE
AIRPORT OPERATORS COUNCIL INTERNATIONAL
and the
AMERICAN ASSOCIATION OF AIRPORT EXECUTIVES
on
THE NEED FOR AN INTEGRATED AIRPORT SURFACE TRAFFIC MANAGEMENT SYSTEM

Before the
Subcommittee on Aviation
Committee on Public Works and Transportation
U.S. House of Representatives

February 28, 1991

Siegbert B. Poritzky
Senior Vice President, Technical Affairs
Airport Operators Council International

AOCI represents the local, regional and state governing bodies that own and operate the principal airports served by scheduled air carriers in the United States and throughout the world. AOCI's member airports enplane more than 90 percent of the total domestic and virtually all international scheduled airline passenger and cargo traffic in the United States.

AAAE is the professional organization representing airport executives who are responsible for the planning, management and operation of airports nationwide.

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Mr. Chairman, I am Siegbert B. Poritzky. I am grateful for the opportunity to testify on behalf of the Airport Operators Council International (AOCI) which represents the local, regional and state governing bodies that own and operate the principal airports served by scheduled air carriers an the United States and throughout the world, and the American Association of Airport Executives (AAAE), the professional organization representing airport executives who are responsible for the planning, management and operation of airports nationwide.

The problem of aircraft and vehicles improperly intruding into live runways and creating a hazard is nearly as old as aviation itself. While most runway incursions create hazards and incidents rather than accidents, a number of lives have been lost in several tragic accidents.

Our message today can be stated simply in three basic points:

- The reduction of the hazard of runway incursions involves many factors, ranging from human performance limitations to the design of optimum signs and lighting. The issue will not yield to simple fixes, no matter how attractive some of them may seem, but must be attacked as a system problem which requires a system solution.

- A sound, well-integrated approach to the development of a modern airport surface traffic management system is needed, using and standardizing the visual aids we already have and incorporating long-neglected new tools modern technology offers. Such an effort can benefit us in two ways -- providing the best possible protection against runway incursion accidents while at the same time providing a full-time efficient management system for busy airports. Solving one problem will automatically solve the other. It is a mistake to attack the runway incursion problem in isolation.

- It is clear, and gratifying, that FAA now plans to pursue this matter vigorously. It is essential that the long-standing and frequently discussed FAA -- and government -- acquisition and procurement problems not be permitted to hamper rapid development and implementation of the elements of the airport surface traffic management system as FAA's system team defines them. Help will be needed from Congress and the Administration to give FAA the resources and a rational way, without roadblocks, to undertake rapid research and development where needed, and to achieve timely implementation of the needed facilities and systems.

The publication by FAA of its Runway Incursion Plan represents a fine first step toward the solution of this long-standing problem. The importance of the Runway Incursion Plan is that it sets the stage for treating the many separate efforts on a **system** basis. This is the first and most important task that must now get under way, and quickly. The effort must sift the many separate FAA efforts which have moved independently, albeit slowly. It must discard the peripheral work, define the system, and then concentrate on the high payoff efforts with resources -- dollars and people. Airport operators support the FAA initiative to deal more energetically with the problem, and are prepared to help FAA in any practical way.

The January 1991 Runway Incursion Plan is a plan of organization for an attack on the problem, and a compendium of many FAA activities which have been under way for a long time as separate endeavors. It is important because it can focus FAA and the industry, which FAA expects to involve heavily in its decision-making process, on the tools and procedures already available for use and pinpoint areas where new technologies and new procedures are needed.

Over the years a number of systems and procedures have been developed and implemented by airports which have an effect on the problem of runway incursions and airport surface operations in general. They are safety procedures, training syllabi and lighting and marking systems for on-airport guidance in good weather and in very bad visibility. More recently we have been working with FAA to develop new and better national and international standards for visual aids -- lighting, signage and marking. As integral parts of the larger system I have tried to describe, these standards can contribute to the safety of on-airport operations.

The effort to attack the problem of runway incursions must look to a variety of remedies. A number of them are not, in the first instance, technical, but rather in the nature of education and training. Airports have been active for many years in providing such training to users of the airport operating area, both airport employees and tenants. The Indianapolis Airport Authority, for example, offers weekly training and cautionary videotape briefings to assure continuous vigilance against runway incursions. They use a training questionnaire to help participants retain the information. Newark airport similarly uses training aids including an examination for vehicle operators and issues a license upon completion of training. Such efforts may need to be expanded, but they require actions in the cockpit as well. It may be necessary to assure that better airport layout charts are developed for cockpit use along with pilot training for their use. New or modified procedures may need to be established to assure that pilots are thoroughly familiar with the airport layouts they encounter. Only in that way can airport signage and marking be fully effective.

Technology must of course be a major element of the system solution. There is no lack of technology. FAA itself has been doing research and development for more than a quarter of a century. Airports have been involved in several approaches, working with FAA. The problem has been that system solutions are expensive and complicated, and not attractive -- until tragedies and loss of life dictate otherwise.

- More than 25 years ago, LFE, Laboratory for Electronics, a company long out of business, developed a primitive airport surface guidance system based in part on railway safety/switching system technology. It was designed to give controllers a clear picture of the airport surface and surface routes.

- Twenty years ago, a magnetic induction loop system called STRACS, which could give information on aircraft to controllers when they were not visible directly, was developed and tried at J.F. Kennedy Airport in New York but soon shelved because of the cost.

- Perhaps fifteen years ago FAA developed a Radar Beacon-based trilateration system which, in association with airport surface radar, could give controllers positive identification of all transponder-equipped vehicles. A prototype system was built and tested at Boston Logan airport, showed promise, but was abandoned.

- A dozen years ago the Transportation System Center conducted an elaborate technology and cost/benefit study of surface surveillance system, selected the optimum technologies -- and determined that the technology could be sensibly applied at seven or eight of the busiest airports. The technologies selected were about the same as are now being resurrected.

Not much happened. Lack of interest, higher priorities for other, more widely applicable projects, FAA budget problems, the emergence of the expensive, high-visibility FAA National Airspace System Plan, all helped to put surface surveillance system work on a dark shelf.

One major effort which did get under way got bogged down in the procurement morass. In 1975 FAA decided to develop a modern version of the surface surveillance radar, ASDE (Airport Surface Detection Equipment), a primitive version of which had been deployed years before at a few U.S. airports.

At that time FAA planned to upgrade the ASDE-2 systems and to "deploy selected improvements to the current systems of lights, signs, and markings for guidance of vehicles on the airport surface". The upgrading proceeded, but FAA based its future planning, then, on completing development of the next generation of airport surface detection radar, using "digitized radar technology" at the end of calendar year 1975, and a complete implementation plan for 30 systems -- 15 ASDE-3's and 15 ASDE-3 systems which would in addition use a trilateration technique to provide vehicle identification in addition to the primary radar returns. Implementation of these 30 systems was planned to be complete by early in calendar year 1979.

ASDE-3 development actually began with a development contract, let through the DOT Transportation System Center to the Cardion Corporation in May 1977, with test and evaluation scheduled (in mid-1978) to be completed by summer 1979. FAA then expected to start production procurement in FY 1980. Problems developed, and a production contract was not let until calendar year 1985, five years later. Because of an FAA procurement procedure which has now been modified, the production contract had to be rebid, and the contract went to a different company. The production contractor (Norden) ran into difficulties, and in its 1987 edition of the NAS Plan, FAA projected first ASDE-3 commissioning for early 1989. By the time the 1989 NAS Plan was issued in September 1989, first commissioning was projected for late 1990, with the last commissioning at the end of 1993, assuming, optimistically, that there are no further difficulties.

Even though this proven safety system has been developed and is in use at a number of major airports outside the U.S., the FAA procurement/acquisition system failed to bring the equipment to beneficial use in a reasonable time in the U.S. The fact is that the government procurement/acquisition system has not worked well in a number of the systems FAA is trying to buy in its major facility upgrade program, causing delays, additional cost and not necessarily first class products. We must not let this happen to FAA's efforts here.

The air traffic control system and FAA's people have coped well and with remarkable safety with burgeoning air traffic. Yet students of the system have long understood that there is a real limit to the number of aircraft and the complexity of the air traffic situations which human controllers can be expected to deal with. John Lauber, a member of the National Transportation Safety Board, said it well: a series of accidents and "the numerous close encounters that we hear about two or three times every week convince us that we are relying too heavily on perfect human performance combined with a bit of luck to assure the safety of landing and departing air traffic".

An essential ingredient is the development of aids to controllers which will help them better comprehend the dynamic traffic situation, and offer advice on specific actions to consider in resolving problems. Such "expert system" help, rapidly growing in importance in airline cockpits and in military systems, has not been pursued actively by FAA. This may be so, in part, because the controller community has been suspicious of such systems, and fear that such automation, misapplied, could rob controllers of authority without relieving them of responsibility. Such fears are probably groundless. The successful "expert systems" have shown that they offer advice and valuable assistance, but don't "take over".

I noted above that providing the highest level of safety and operational efficiency are goals which are achievable by the same remedies. They require looking at the airport surface **as a system**, and that has never been done successfully. Airport operators support the FAA initiative to deal more energetically with the problem, and are prepared to help.

The FAA effort must fully integrate a variety of tasks, all of which interconnect:

a) efforts to achieve better and more uniform runway and taxiway lighting and signage, and adequate airport layout charts in the cockpit along with training and procedures to assure their use.

b) improved on-airport visual guidance during both good weather and in Category 2/3 conditions,

c) provision of better information to air traffic controllers through implementation of ASDE and its enhancements, and better tools to help controllers keep aware of the total airport situation.

d) better definition and policy decisions concerning the implementation and use of controller-operated or automatic stop-bars.

e) R&D and decisions on the best ways to achieve real automation aids for major airports for both the ATC system and controllers to optimize the operation and management of the airport resource.

f) Since the ground rules for controller functions and responsibilities when aircraft are on the runway surface are different from those when aircraft are airborne or are on or crossing active runways, those functions and responsibilities need to be examined, and perhaps refined, for busy or historically incursion-prone airports.

Actions Needed Now:

AOCI and AAAE believe the ingredients are in place for early progress. We believe it would be appropriate for FAA to move rapidly to complete and implement the efforts (signage, visual aids, ASDE radar and its enhancements) long underway.

At the same time FAA should prepare, within the next 60 days, an **action plan which shows an integrated airport surface traffic management and incursion control system with the roles of the various elements (lighting systems; signage; surveillance, control and communications technologies; needed R&D; needed automation help using logic "expert" systems, etc.) clearly defined.** The action plan should show **milestones and estimated time for completion** of the several elements of the integrated system. The action plan should show the **funding required** to carry the elements to early completion **vis a vis current funding** and current funding projections. The plan should also identify problems in the procurement process which might create unwarranted delays.

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ADDITION TO THE RECORD

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March 19, 1991

The Honorable James L. Oberstar
Chairman, Subcommittee on Aviation
Committee on Public Works and Transportation
2251 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Oberstar:

The Subcommittee on Aviation addressed the very important subject of "Ground Collisions and Runway Incursions" in a hearing held on February 28, 1991.

A resident of the State of Washington, Mr. James R. Van Osdell, has technology which might help alleviate congestion at airports and improve ground safety. As described, his Airport Ground Management System (AMS) would utilize available technology to tow aircraft on and off runways, thereby increasing safety and saving valuable aviation fuel.

I would like to respectfully ask that Mr. Van Osdell's testimony be made part of the permanent hearing record. Thank you for your attention to this request.

Sincerely,

ROD CHANDLER
Member of Congress

RC:dk
cc: James R. Van Osdell
Attachment

THIS STATIONERY PRINTED ON PAPER MADE OF RECYCLED FIBERS

Honorable James L. Oberstar Chairman
Public Works and Transportation Committee
Sub Committee on Aviation

Subject: Ground Collision and Runway Incursions "Hearing"

Mr. Chairman, I am honored for the opportunity to present written testimony to your committee in support of the hearing on "Ground Collision and Runway Incursions" that was held February 28th, 1991.

The growing commercial aviation industry has created an undesirable amount of congestion at many of our principal airports. The probability of accidents, like the recent ones at Detroit and Los Angels, happening again I believe, is very high. We must ask ourselves "what can be done to reduce the probability"?

I would like to offer, for your consideration, a system which I believe could probably aid in reducing the chances of that type of accident ever happening again.

During the early nineteen seventies, Vanley Systems embarked on a research project to develop an "Airport Ground Traffic Management System" designed to manage the ground traffic at commercial airports. During peak traffic times, the aircraft entering and leaving the ramp area common to the terminal concourses, plus all of the ground equipment milling around, create a very unsafe environment. Add inclement weather with fog, and you have all of the ingredients for a disaster, and in Detroit it happened. How can we avoid the disaster?

The Airport Ground Traffic Management System is made up of several elements; robotic baggage tractor/trailer trains, movement control systems on galley trucks, lavatory and potable water trucks, crew vans and other miscellaneous vehicles, and robotic tractors towing the aircraft to and from the runway "Aircraft Movement System (AMS)".

The Aircraft Movement System (AMS), an element of the Airport Ground Traffic Management System, is a taxi speed towing service. One of the principle benefits of the AMS is the safety which it affords the airline and other traffic on the airport. This is accomplished by the use of the robotic tractor to tow the airplane. As a robot the tractor follows a predetermined route at all times. the location of the tractor and the aircraft that is being towed is always known to the ground traffic controller as well as the AMS dispatcher, and the control tower people.

I would like to describe to you the operating cycle of the AMS at a typical airport. The AMS fleet is positioned at convenient locations on the airport complex. As an aircraft is landing, the AMS is summoned to meet the aircraft at the end of the runway. The AMS moves under automatic guidance or manual control to meet the aircraft and then directs the aircraft into towing position.

Operation control is transferred to the aircraft pilot in the cockpit when the umbilical is plugged into the aircraft. Ground personnel can no longer operate the AMS until control is relinquished by the pilot. The aircraft engines are now stopped. Conditioning air and electrical power from the AMS are available options.

Movement to the assigned gate is accomplished by the computer controlled robotic tow tractor While the AMS has powerful brakes of its own the mated pair, aircraft and AMS, are braked only by the aircraft's own brakes, actuated by the pilot.

After the aircraft has parked, the AMS is disconnected and returned to the standby area. If the aircraft is on a quick turnaround, the AMS may be left connected for an early return to the takeoff point.

Movement to the takeoff point, after reconnecting the AMS, is again under pilot control. The engines are not restarted until the takeoff point is near or reached. Conditioning air and electrical power again, are optionally furnished by the AMS as is engine start air.

The AMS is disconnected by ground personnel and the unit returns to the standby area under automatic or manual control. The aircraft is then free to start its flight.

Now that you have a better understanding of how the AMS operates, I believe you now can see the built in safety features of the AMS. The tractor will safely tow an airplane to the active runway over a predetermined route regardless of the ground traffic or adverse weather conditions. It will never get confused or lost and inadvertently create an unsafe condition, such as those at Tenerife, Detroit and Los Angles.

Some of the European airlines have been towing their airplanes at their major airports for some time now. As reported in the International aviation publications, they are planning to expand the policy as technology permits. Since the technology of the AMS is far more advanced than that in Europe we would feel we at Vanley have an obligation to our country to participate in maintaining the technological advantage we have enjoyed for so many years.

In closing again I would like to thank you for the opportunity to present to you this information and hope it may contribute in some manner to making our aviation industry more safe. As one airline pilot commented to me, "if we hope to use our autoland capability in CAT II and CAT III configuration we had better figure out some way to get them from the runway to the terminal without them getting lost".

We have a large amount of data to support the use of the system. If there are any questions or you would like more definitive information please feel free to call on us.

Regards

James R. Van Osdell
President

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